

Name:

Date:

INSTRUCTIONS TO CANDIDATES**Section A (40 marks)****Time: 45 minutes**

1. Answer **all** the questions in this section.
2. Calculators may **not** be used in this section.
3. All working must be clearly shown. Omission of essential working will result in loss of marks.
4. The marks for each question is shown in brackets [] at the end of each question.

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- 1 (a) A recipe for a 500 g butter cake contains butter, icing sugar and flour in the ratio 8 : 3 : 9. How much butter is needed to make 80 such cakes? Give your answer in kilograms.
- (b) 12 men took 6 hours to complete $\frac{2}{3}$ of a job. To speed up the work, another 6 men were hired. How many more hours of work are needed before the job is completed?

Answer (a) kg [2]

(b) h [3]

- 2 (a) A train travels 240 km in 5 hours. Calculate the speed of the train in
(i) kilometres per hour,
(ii) metres per second.
(b) Mr Lee drove from Singapore to Malacca which was 260 km away to attend a conference. If his car can travel 12 km on one litre of petrol and petrol costs \$1.50 per litre, how much would he spend on petrol for the journey to Malacca?

Answer (a) (i) km/h [1]

(ii) m/s [1]

(b) \$ [1]

-
- 3 In a factory bottling an orange-lemonade drink, lemon juice is mixed with orange juice in the ratio 3 : 8. The drink is then bottled in small and large bottles. The ratio of the volume of drink in the small bottle to the large bottle is 5 : 11. If there are 600 ml of orange-lemonade drink in a small bottle, how much lemon juice is there in a large bottle?

Answer ml [3]

- 4 (a) The ratio of the marbles in Box A to Box B is 3 : 8. After some marbles were transferred from Box B to Box A, Box A will have $\frac{2}{3}$ the number of marbles as Box B. Given that Box A had 210 marbles at first, find the number of marbles that were transferred to Box A.
- (b) An antique dealer bought an antique clock for \$800 and an antique cupboard for \$3200. If he sold the clock at a profit of 45% and the cupboard at a loss of 15%, find his percentage gain or loss for selling both items.

Answer (a) marbles [3]

(b) % [2]

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- 5 A furniture shop earns a 20% profit when it sells a rocking chair for \$300.
- (a) If the shop gives a 5% discount to a customer during a sale, how much must the customer pay?
- (b) Calculate the cost price of the rocking chair.

Answer (a) \$ [1]

(b) \$ [2]

- 6 (a) On a certain day, a bank exchanged American dollars (\$) for British pounds (£) at the rate of $\$1.60 = \text{£}1$. Calculate in dollars, the amount received in exchange for $\text{£}800$.
- (b) A bus left Town A at 07 30 for Town B, travelling at an average speed of 18 km/h. At 09 00, a car left Town A travelling on the same route to Town B as the bus. If the car takes 3 hours to catch up with the bus, find the average speed of the car.

Answer (a) \$ [1]

(b) km/h [4]

- 7 (a) A stamping machine in a factory can produce 15 000 circular aluminium discs in 1 hour 15 minutes. Calculate the rate of stamping of the machine per minute.
- (b) Linda invested \$5000 into Plan A which pays 2% interest per annum and \$8000 into Plan B. If she received a total of \$1020 in interest from both plans at the end of 3 years, how much interest does Plan B pay per annum?

Answer (a) discs/min [1]

(b) % [3]

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- 8 How many litres of Solution A which contains 74% acid need to be combined with 5 litres of Solution B containing 90% acid in order to obtain a mixture containing 84% acid?

Answer l [4]

- 9 (a) Peter and 5 of his friends had dinner at a restaurant. The bill for the dinner was \$300 before a 10% service charge and a 5% GST were added. If the bill is to be split equally among everyone, how much does each of them have to pay?
- (b) Michael works from 07 00 to 16 00 which includes a one-hour break in between. He is paid an hourly rate of \$8 which excludes his one-hour break. How much will he earn in a certain month which has 4 weeks, working 3 days a week?

Answer (a) \$ [2]

(b) \$ [2]

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- 10 Marc wanted to buy a guitar which cost \$600 if payment is made in cash. He decided to pay using a hire purchase scheme offered by the shop. He only needs to pay a deposit of \$150 and the rest by monthly instalments of \$30 over a period of $1\frac{1}{2}$ years. Find the percentage savings if he had paid for the guitar in cash.

Answer % [4]

INSTRUCTIONS TO CANDIDATES

Section B (40 marks)

Time: 45 minutes

1. Answer **all** the questions in this section.
 2. Calculators may be used in this section.
 3. All working must be clearly shown. Omission of essential working will result in loss of marks.
 4. The marks for each question is shown in brackets [] at the end of each question.
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- 11 (a) Mr Lee invested S\$100 000 in Malaysia at 6% per annum simple interest when the exchange rate was S\$1 = RM2.25. After $5\frac{1}{2}$ years, he withdrew the interest gained from his investment. The exchange rate then was S\$1 = RM2.06. Calculate the amount in Singapore dollars, correct to the nearest cent, that he would receive.
- (b) Jeremy invested \$3000 in a bank that pays a simple interest of 5% per annum. How long will it take for the amount to add up to \$3975?

Answer (a) S\$ [4]

(b) years [3]

- 12 The utilities bill of Mr Goh's household in January is shown below. The Water Conservation Tax is 30% of the current charges of water used in that month. The Goods and Services Tax imposed is 5%.

Answer (a), (b), (c), (d), (e)

[5]

Current Month Charges	Usage	Rate (\$)	Amount (\$)
Electricity		0.15	60.60
Water	20 units	1.17	
Water Conservation Tax			
Refuse removal			7.58
Goods and Services Tax			
Total charges for this month			

Calculate

- (a) the amount of water used in January,
- (b) the number of units of electricity used in January,
- (c) the amount of the Water Conservation Tax,
- (d) the amount of the Goods and Services Tax,
- (e) the total charges for January.

- 13 (a) The ratio of boys to girls in a Mathematics Enrichment Class is 5 : 7. If 8 more girls joined the class, the ratio of boys to girls will be 3 : 5. How many children were there in the class at first?
- (b) Given that 0.25% of 5% of a number is 0.315, find the number.
- (c) Jeffrey rented a stall for \$1134 over a weekend to sell styrofoam aeroplanes. The cost of each aeroplane is 52¢ and he intends to sell each aeroplane for \$1.60.
- (i) How many aeroplanes must he sell in order to break even?
- (ii) If he can only sell 520 aeroplanes on Saturday and 280 aeroplanes on Sunday, how much loss would he suffer?
- (iii) How much profit will he make if he sold 2000 aeroplanes over the weekend instead?

Answer (a) children [3]

(b) [2]

(c) (i) aeroplanes [3]

(ii) \$ [1]

(iii) \$ [1]

14 Town A and Town B are 260 km apart.

(a) (i) James left Town A for Town B at 06 30, driving at an average speed of 65 km/h. At what time will he reach Town B?

(ii) He stayed in Town B for $3\frac{3}{4}$ hours before returning. If he arrived back in Town A at 19 27, calculate the average speed of his return journey.

(b) Tim left Town A at the same time as James for Town C to attend a seminar. He was travelling at an average speed of 80 km/h. He arrived in Town C 20 minutes late for the seminar. If he had travelled 10 km/h faster, he would have arrived 5 minutes earlier. Find the distance between Town A and Town C.

Answer (a) (i) [2]

(ii) km/h [3]

(b) km [4]

- 15 Mr Lee invested \$50 000 in a bank that paid compound interest at the rate of 2% per year. At the end of the 3rd year, he withdrew all the money and divided them among his sons, Andrew, Bobby and Carl in the ratio 5 : 8 : 11 respectively.
- (a) How much money did Mr Lee withdraw?
 - (b) How much money did Bobby receive?
 - (c) Andrew used all his share of the money to buy a motorcycle at 15% discount. Find the original price of the motorcycle.
 - (d) Carl bought a jeep that cost \$125 000. He used all his share of the money to pay for part of the jeep and took a 8-year bank loan to pay for the rest. The bank charged him an interest of 2.5% per annum.
 - (i) Calculate the total amount of interest he has to pay.
 - (ii) Calculate each of the monthly instalments he has to pay, giving your answer correct to the nearest cent.
 - (iii) If he pays for the jeep by cash, a discount of 12% will be given. Express the difference between the cash price and hire purchase price as a percentage of the cash price.

Answer (a) \$ [2]

(b) \$ [1]

(c) \$ [2]

(d) (i) \$ [2]

(ii) \$ [1]

(iii) % [1]

Worked Solutions to Test Papers

(MATHEMATICS Topical Test Papers for Secondary 2)

Test 1: Arithmetic Problems

Section A

1. (a) Amount of butter needed to bake 80 cakes

$$\begin{aligned}
 &= 80 \times \left(\frac{8}{8+3+9} \times 500 \right) \\
 &= 80 \times \frac{8}{20} \times 500 \\
 &= 16\,000 \text{ g} \quad 1 \text{ kg} = 1000 \text{ g} \\
 &= \mathbf{16 \text{ kg}}
 \end{aligned}$$

- (b) 12 men took 6 hours to complete $\frac{2}{3}$ of the job.

$$\therefore 1 - \frac{2}{3} = \frac{1}{3} \text{ of the job left.}$$

$$\frac{2}{3} \text{ job} \leftrightarrow 6 \text{ hours} \quad \text{Direct proportion}$$

$$\frac{1}{3} \text{ job} \leftrightarrow x \text{ hours}$$

$$\frac{x}{6} = \frac{\frac{1}{3}}{\frac{2}{3}}$$

$$\begin{aligned}
 x &= \frac{1}{\cancel{3}_1} \times \frac{\cancel{3}^1}{\cancel{2}_1} \times \cancel{6}^3 \\
 &= 3
 \end{aligned}$$

$$\therefore 12 \text{ men took 3 hours to complete } \frac{1}{3} \text{ of the job.}$$

$$12 \text{ men} \leftrightarrow 3 \text{ hours}$$

$$18 \text{ men} \leftrightarrow y \text{ hours}$$

$$y \times 18 = 3 \times 12$$

$$\begin{aligned}
 y &= \frac{\cancel{3}^1 \times \cancel{12}^2}{\cancel{18}_{6_1}} \\
 &= 2
 \end{aligned}$$

$$\therefore 18 \text{ men took 2 hours to complete } \frac{1}{3} \text{ of the job.}$$

\therefore **2 more hours** are needed before the job is completed.

2. (a) (i) Speed = $\frac{240 \text{ km}}{5 \text{ h}}$
= **48 km/h**

$$\text{Use Speed} = \frac{\text{Distance}}{\text{Time}}$$

(ii) Speed = 48 km/h
= $\frac{48 \times 1000 \text{ m}}{1 \times 60 \times 60 \text{ s}}$
= $13 \frac{1}{3} \text{ m/s}$

$$\begin{aligned}
 1 \text{ km} &= 1000 \text{ m} \\
 1 \text{ h} &= 60 \text{ min} \\
 &= 60 \times 60 \text{ s}
 \end{aligned}$$

(b) Cost of petrol = $\left(\frac{260}{12} \right) \times \1.50
= **\$32.50**

3. Vol. of drink in large bottle = $\frac{11}{5} \times 600 \text{ ml}$
= **1320 ml**

Amount of lemon juice in large bottle

$$= \left(\frac{3}{3+8} \right) \times 1320$$

$$\begin{aligned}
 &= \frac{3}{11} \times 1320 \\
 &= \mathbf{360 \text{ ml}}
 \end{aligned}$$

4. (a) No. of marbles in Box A at first = 210 (Given)
Total no. of marbles in Box A and Box B at first

$$= \frac{3+8}{3} \times 210$$

$$= \frac{11}{3} \times 210$$

$$= 770$$

No. of marbles in Box A after the transfer

$$= \frac{2}{2+3} \times 770$$

$$= 308$$

Box A : Box B

$$\begin{array}{l}
 \frac{2}{3} : 1 \\
 \frac{3}{2} : 3
 \end{array}$$

No. of marbles transferred to Box A

$$= 308 - 210$$

$$= \mathbf{98}$$

- (b) Profit from selling clock

$$= 45\% \times \$800$$

$$= \frac{45}{100} \times \$800$$

$$= \$360$$

Loss from selling cupboard

$$= 15\% \times \$3200$$

$$= \frac{15}{100} \times \$3200$$

$$= \$480$$

Loss for selling both items

$$= \$480 - \$360$$

$$= \$120$$

Percentage loss

$$= \frac{120}{80 + 3200} \times 100\%$$

$$= \frac{120}{4000} \times 100\%$$

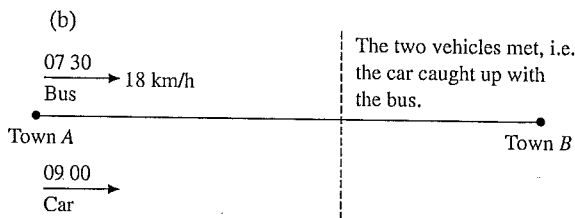
$$= \mathbf{3\%}$$

Percentage loss

$$= \frac{\text{Loss}}{\text{Cost price}} \times 100\%$$

5. (a) Discounted price
 $= 95\% \times \$300$
 $= \frac{95}{100} \times \300
 $= \$285$
- (b) Selling price = $120\% \times$ Cost price
 $\$300 = \frac{120}{100} \times$ Cost price
 Cost price = $\frac{100}{120} \times \$300$
 $= \$250$

6. (a) $\$1.60 = \text{£}1$
 $\text{£}800 = \$(800 \times 1.60)$
 $= \$1280$



$$09\ 00 - 07\ 30 = 1\ \frac{1}{2}\ \text{h}$$

$$1\ \frac{1}{2}\ \text{h} + 3\ \text{h} = 4\ \frac{1}{2}\ \text{h}$$

\therefore the bus had travelled $4\ \frac{1}{2}\ \text{h}$ when the car caught up with it.

Total distance travelled by the bus in $4\ \frac{1}{2}\ \text{h}$

$$= 18\ \text{km/h} \times 4\ \frac{1}{2}\ \text{h}$$

$$= 81\ \text{km}$$

Total distance travelled
 = Average speed \times time taken



Teacher Tip

When the car caught up with the bus, they had travelled the same distance from Town A.

\therefore distance travelled by the car in 3 hours = 81 km
 Average speed of the car

$$= \frac{81\ \text{km}}{3\ \text{h}}$$

Average speed = $\frac{\text{Total distance travelled}}{\text{Total time taken}}$

$$= 27\ \text{km/h}$$

7. (a) Rate of stamping
 $= \frac{15\ 000\ \text{discs}}{75\ \text{min}}$
 $= 200\ \text{discs/min}$

- (b) Simple interest earned from Plan A

$$= \frac{5000 \times 2 \times 3}{100}$$

$$= \$300$$

Simple interest; $I = \frac{PRT}{100}$

where P = Principal,
 R = Rate (per annum) and
 T = Time (in years).

Let $r\%$ be the interest per annum paid for Plan B.
 Simple interest earned from Plan B

$$= \frac{8000 \times r \times 3}{100}$$

$$= \$240r$$

$$\therefore \$300 + \$240r = \$1020$$

$$\$240r = \$720$$

$$r = \frac{720}{240} = 3$$

\therefore Plan B pays 3% interest per annum.

Interest from both plans
 $= \$1020$ (Given)

8. Let x represent the no. of litres of Solution A.

	No. of litres	Percentage of acid	No. of litres of acid
Solution A	x	74	$\frac{74}{100} \times x = 0.74x$
Solution B	5	90	$\frac{90}{100} \times 5 = 4.5$
Mixture	$x + 5$	84	$\frac{84}{100} \times (x + 5)$ $= 0.84(x + 5)$

$$\therefore 0.74x + 4.5 = 0.84(x + 5)$$

$$74x + 450 = 84(x + 5)$$

$$74x + 450 = 84x + 420$$

$$30 = 10x$$

$$x = \frac{30}{10} = 3$$

\therefore 3 litres of Solution A are needed.

Multiply both sides by 100.

9. (a) Total amount of bill
 $= 115\% \times \$300$
 $= \frac{115}{100} \times \300
 $= \$345$
 Amount each of them has to pay
 $= \frac{\$345}{6}$
 $= \$57.50$

- (b) No. of hours of work a day
 $= 16\ 00 - 07\ 00 - 1\ \text{h}$
 $= 8\ \text{h}$
 Amount earned in 4 weeks
 $= 4 \times 3 \times 8 \times \8
 $= \$768$

He worked for
 4 weeks,
 3 days a week,
 8 hours a day.

10. Total amount paid using hire purchase

$$= \$150 + (18 \times \$30)$$

$$= \$150 + \$540$$

$$= \$690$$

Percentage savings

$$= \frac{\$690 - \$600}{\$600} \times 100\%$$

$$= \frac{\$90}{\$600} \times 100\%$$

$$= 15\%$$

Deposit = \$150

$1\ \frac{1}{2}$ years = 18 months

Section B

11. (a) S\$1 = RM2.25
 S\$100 000 = RM(100 000 × 2.25)
 = RM225 000

Interest gained after $5\frac{1}{2}$ years

$$= \frac{225\,000 \times 6 \times 5\frac{1}{2}}{100}$$

$$= \text{RM}74\,250$$

$$\text{RM}2.06 = \text{S}\$1$$

$$\text{RM}1 = \text{S}\$ \left(\frac{1}{2.06} \right)$$

$$\text{RM}74\,250 = \text{S}\$ \left(\frac{1}{2.06} \times 74\,250 \right)$$

$$\approx \text{S}\$36\,043.69 \text{ (correct to the nearest cent)}$$

∴ he would receive **S\$36 043.69**.

(b) Interest = Amount – Principal
 = \$3975 – \$3 000
 = \$975

$$975 = \frac{3000 \times 5 \times T}{100}$$

$$T = \frac{975 \times 100}{3000 \times 5}$$

$$= 6.5 \text{ years}$$

∴ it would take **6.5 years** for the amount to add up to \$3975.

12.

Current Month Charges	Usage	Rate (\$)	Amount (\$)
Electricity	404	0.15	60.60
Water	20 units	1.17	23.40
Water Conservation Tax			7.02
Refuse removal			7.58
Goods and Services Tax			4.93
Total charges for this month			103.53

(a) Amount of water
 = $20 \times \$1.17$
 = **\$23.40**

(b) No. of units of electricity used in January
 = $\frac{\$60.60}{\$0.15}$
 = **404**

(c) Amount of the Water Conservation Tax
 = $30\% \times \$23.40$
 = $\frac{30}{100} \times \$23.40$
 = **\$7.02**

(d) Amount of the Goods and Services Tax
 = $5\% \times (\$60.60 + 23.40 + 7.02 + 7.58)$
 = $\frac{5}{100} \times \$98.60$
 = **\$4.93**

(e) Total charges for January
 = $\$98.60 + \4.93
 = **\$103.53**

13. (a) Boys : Girls
 Before: 5 : 7 = 15 : 21
 After: 3 : 5 = 15 : 25 } + 8 girls

∴ 4 units — 8 girls

1 unit — $\frac{8}{4} = 2$ girls

$15 + 21 = 36$ units — $36 \times 2 = 72$ children

∴ there were **72 children** in the class at first.

(b) Let x be the required number.

$$0.25\% \times (5\% \times x) = 0.315$$

$$\frac{0.25}{100} \times \frac{5}{100} \times x = 0.315$$

$$x = \frac{0.315 \times 100 \times 100}{0.25 \times 5}$$

$$= 2520$$

∴ the number is **2520**.

(c) (i) Profit from selling each aeroplane
 = $\$1.60 - 52¢$
 = $\$1.08$

Let x be the no. of aeroplanes he needs to sell to break even.

$$\therefore \$1.08x = \$1134$$

$$x = \frac{1134}{1.08} = 1050$$

∴ he needs to sell **1050 aeroplanes** in order to break even.

(ii) Total no. of aeroplanes sold
 = $520 + 280$
 = 800

Loss = $\$1134 - 800(\$1.08)$
 = $\$1134 - \864
 = **\$270**

(iii) Profit = $2000(\$1.08) - \1134
 = $\$2160 - \1134
 = **\$1026**

14. (a) (i) Total time taken

$$= \frac{260 \text{ km}}{65 \text{ km/h}}$$

$$= 4 \text{ h}$$

$$06\,30 + 4 \text{ h} = 10\,30$$

∴ he will reach Town B at **10 30**.

Total time taken:

$$= \frac{\text{Total distance travelled}}{\text{Average speed}}$$

$$(ii) 19\ 27 - 3\ \frac{3}{4}\ h$$

$$= 15\ 42$$

$$15\ 42 - 10\ 30$$

$$= 5\ h\ 12\ min$$

$$= 5\ \frac{12}{60} = 5\ \frac{1}{5}\ h$$

18	87
19	27
- 3	45
15	42
15	42
- 10	30
5	12

Total time taken for return journey = $5\ \frac{1}{5}\ h$

Average speed of return journey

$$= \frac{260\ km}{5\ \frac{1}{5}\ h}$$

Average speed
= $\frac{\text{Total distance travelled}}{\text{Total time taken}}$

$$= 50\ km/h$$

- (b) Let d km be the distance between Town A and Town C.

$$\frac{d}{80} - \frac{d}{80 + 10} = \frac{20 + 5}{60}$$

Total time taken
= $\frac{\text{Total distance travelled}}{\text{Average speed}}$

$$\frac{d}{80} - \frac{d}{90} = \frac{5}{12}$$

$$\frac{9d - 8d}{720} = \frac{5}{12}$$

$$\frac{d}{720} = \frac{5}{12}$$

$$d = \frac{5}{12} \times 720$$

$$= 300$$

\therefore the distance between Town A and Town C is 300 km.

15. (a) 1st year: $\$50\ 000 \times 1.02 = \$51\ 000$
 2nd year: $\$51\ 000 \times 1.02 = \$52\ 020$
 3rd year: $\$52\ 020 \times 1.02 = \$53\ 060.40$
 \therefore Mr Lee withdrew $\$53\ 060.40$.



Teacher's Tip

Compound interest is interest that is not calculated based on the original sum but compounded annually.

- (b) Amount received by Bobby

$$= \frac{8}{5 + 8 + 11} \times \$53\ 060.40$$

$$= \$17\ 686.80$$

- (c) Amount received by Andrew

$$= \frac{5}{5 + 8 + 11} \times \$53\ 060.40$$

$$= \$11\ 054.25$$

85% of original price = $\$11\ 054.25$

$$\frac{85}{100} \times \text{Original price} = \$11\ 054.25$$

$$\text{Original price} = \frac{100}{85} \times \$11\ 054.25$$

$$= \$13\ 005$$

\therefore the original price of the motorcycle was $\$13\ 005$.

- (d) (i) Amount received by Carl
 $= \$53\ 060.40 - \$17\ 686.80 - \$11\ 054.25$
 $= \$24\ 319.35$

$$\text{Balance} = \$125\ 000 - \$24\ 319.35$$

$$= \$100\ 680.65$$

Total amount of interest

$$= \$100\ 680.65 \times \frac{2.5}{100} \times 8$$

$$= \$20\ 136.13$$

- (ii) Amount of each monthly instalments

$$= \frac{\$100\ 680.65 + \$20\ 136.13}{96}$$

8 years
= 8×12
= 96 months

$$= \frac{\$120\ 816.78}{96}$$

$$\approx \$1258.51 \text{ (correct to the nearest cent)}$$

- (iii) Cash price = 88% of $\$125\ 000$

$$= \frac{88}{100} \times \$125\ 000$$

$$= \$110\ 000$$

Required percentage

$$= \frac{(\$120\ 816.78 + \$24\ 319.35) - \$110\ 000}{\$110\ 000} \times 100\%$$

$$\approx 31.9\% \text{ (correct to 3 sig. fig.)}$$