TEST 12	Arithmetical Problems	Marks: /60

Time: 1 hour 30 minutes

Name: ....   Date: ....

INSTRUCTIONS TO CANDIDATES

Section A (30 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.

1   (a) Find the value of $5\frac{1}{2}\%$ of 600 m.

    (b) Express 45 minutes as a percentage of 3 hours.

    (c) Express $12\frac{4}{5}\%$ as a decimal.

Answer (a) .... m [1]

(b) .... % [1]

(c) .... [1]

2 (a) The cost of painting a 3-room HDB flat in 2004 was $690 which was 15% more than it was in 2003. Find the cost of painting a 3-room HDB flat in 2003.

(b) A digital camera was advertised as $320 before 5% GST was included. Find the price of the digital camera after GST was added.

Answer (a) $ .... [1]

(b) $ .... [1]

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3 Mrs Rani, a shop owner makes a profit of 20% for every pair of shoes she sold.

(a) What is the selling price of a pair of boots which cost Mrs Rani $250?

(b) Mrs Rani sold a pair of stilettos for $456. Find the cost price of the pair of stilettos.

(c) Mrs Rani made a profit of $24 when she sold a pair of sneakers. Calculate the selling price of the pair of sneakers.

Answer (a) $ .... [1]

(b) $ .... [1]

(c) $ .... [2]

4   Mr Tan bought an ink jet printer for $300. He sold it giving a 25% discount of the marked price and a made a profit of 10%. Calculate
    (a) the selling price of the printer,
    (b) the marked price of the printer.

Answer (a) $ .... [1]

(b) $ .... [1]

5   A man bought 10 boxes of springs at $200 per box. He sold 8 boxes at $240 and the rest at cost price. Find his percentage profit.

Answer ....% [3]

6   A bank pays simple interest at the rate of 3.5% per year. How much must Helen have in the bank to earn an interest of $280 in 5 years?

Answer $ .... [3]

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7   The price of the latest handphone is S$700 in a shop in Orchard Road.
   (a) A British tourist wants to purchase the handphone and would like to pay in British pounds (£). Find the price he has to pay (in £).
   (b) Another tourist from Malaysia also wants to purchase the handphone. He is entitled to a 10% discount when he presents a discount voucher. If he wants to pay in Malaysian currency, how much would he need?

Local $ to 1 unit	
Sterling pound (£)	2.80
Local $ to 100 units	
Malaysian Ringgit (RM)	45.00

Answer (*a*) £ .... [2]

(*b*) RM .... [2]

8   An antique collector suffered a loss of 20% by selling an antique chest for $1280. How much should he have sold the antique chest if he wanted to make a profit of 15%?

Answer $.. [3]

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9   Mr Rahmat's annual income last year was $24 800. His total tax reliefs amounted to $3200.
    (a) Calculate his chargeable income.
    (b) If he is paying tax according to the tax rates given in the table below, calculate his tax payable.

Chargeable Income ($)	Rate (%)
On the first $10 000	2
On the next $12 500	5

Answer (a) $................................... [1]

(b) $................................ [2]

10 During the Great Singapore Sale, a departmental store gave a storewide discount of 20%. The departmental store's members will enjoy an additional 5% discount. Mrs Jaysree, a member of the departmental store wanted to buy a mattress which was priced at $3400.
   (a) How much would she need to pay?
   (b) The store provided its customers with an interest free hire purchase term where customers will only need to pay a down payment of 10% of the price of the item. If Mrs Jaysree plans to buy the mattress by hire purchase,
       (i) find the amount of deposit she needs to pay,
       (ii) the cost of each monthly instalment if she intends to pay for the rest of the mattress in 10 equal instalments?

Answer (a) $ .... [1]

(b) (i) $ .... [1]

(ii) $ .... [1]

Section B (30 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.

11 (a) Melissa and Timothy each opened an account in the bank.
  (i) Melissa deposited $2000 into her account. This account pays simple interest at the rate of 6% per annum. Calculate the total amount in her account after 2 years.
  (ii) Timothy deposited $2000 into his account. This account pays compound interest at the rate of 6% per annum. Calculate how much more money he will have in his account compared to Melissa's account after 2 years.
  (b) George took a loan from the bank at 10% compound interest. After 2 years he owed the bank $19 965. How much was the loan George took? (Assume that George did not repay the bank during the 2 years.)

Answer (a) (i) $ .... [1]

(ii) $ .... [2]

(b) $ .... [3].

12 (a) James planned to take his family for a vacation in America and Canada during the holidays. He changed S$10 500 to US dollars and S$7350 to Canadian dollars. The exchange rates of Singapore dollars to US dollars and Canadian dollars are shown in the table below.

(i) Calculate the amount of US dollars and Canadian dollars he received.

(ii) Due to an outbreak of bird flu, he had to cancel the trip. So he change all his US dollars and Canadian dollars back to Singapore dollars. How much Singapore dollars did he lose?

Exchange rate Local $ to 1 unit		
	Bank buys	Bank sells
US dollars (US$)	1.67	1.68
Canadian dollars (C$)	1.10	1.12

(b) A car costs $95 000 when new and depreciates by 15% at the end of the first year. In the second year it depreciates a further 20%. Find the value of the car at the end of 2 years.

Answer (a)(i) US$ ....

C$ .... [2]

(ii) S$ .... [2]

(b) $ .... [2]

13 (a) Mr Lee bought 200 binders for $16. He threw away 4% of the binders which was faulty and packed the rest into bags with an equal number of binders. If he sold each bag of binders for $3.60 in order to make a profit of 80%, find the number of binders in each packet.

(b) PQ is a metal rod of length 84 cm with a bead, T threaded through it as shown in the diagram. The distance of PT is 28 cm. The bead is then shifted to the right so that the distance of PT is increased by 8%. Calculate the percentage decrease in the distance of QT.

P ——————————————⊕—————————————————— Q
                          T
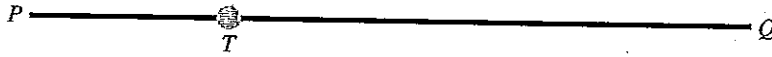
Answer (a) .... binders [3]

(b) .... % [2]

14 The price of a new truck in a showroom is $80 000.
   (a) Mr Samy bought the truck and was given a special discount by the sales agent. Given that he paid $73 200, calculate the percentage discount he received.
   (b) Mr Goh bought the new truck on hire purchase. He paid a deposit of $6800 followed by $1433.50 each month for 5 years.
   Calculate
   (i) the extra cost incurred by paying by hire purchase,
   (ii) the rate of interest charged per annum.

Answer (a) .... % [2]

(b) (i) $ .... [2]

(ii) .... % [3]

15 (a) The monthly basic salary of Mr Jacobs in 2002 was $5750. He was also paid a bonus of 0.85% of the value of sales that he had made that year. If the value of the sales in 2002 was $1.2 million, calculate the total income (basic salary plus bonus) he received in 2002.

(b) In 2003, his monthly basic salary was increased by 3.2%.
   (i) Calculate his total basic salary in 2003.
   (ii) In 2003 he was again paid a bonus of 0.85% of the value of sales that he had made that year. If his total income for 2003 was $78 484, calculate the value of the sales he made in 2003.

Answer (a) $ .... [2]

(b) (i) $ .... [2]

(ii) $ .... [2]

(ii) $\begin{array}{r} 13\ 57 \\ -\ 08\ 45 \\ \hline 05\ 12 \\ \hline \end{array}$ (Arrival time)

(Starting time)

(Journey time)

$\longrightarrow 5\dfrac{12}{60}\text{ h} = 5\dfrac{1}{5}\text{ h}$

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

$= \dfrac{260 \text{ km}}{5\dfrac{1}{5}\text{ h}}$

$= 50 \text{ km/h}$

∴ the average speed of the bus on the return journey is **50 km/h**.

(b)

$$\text{Singapore} \bullet \xrightarrow[\ V\,km/h\ ]{3\frac{3}{4}\,h} \bullet \text{Malacca}$$

$$\text{Singapore} \bullet \xrightarrow[\ (V+8)\,km/h\ ]{3\frac{3}{4}-\frac{1}{2}=3\frac{1}{4}\,h} \bullet \text{Malacca}$$

Let the distance from Singapore to Malacca be d km.

Total distance travelled

= Average speed × Total time taken

$d = V \text{ km/h} \times 3\dfrac{3}{4}\text{ h}$

$= 3\dfrac{3}{4}V \text{ km} \quad\text{——(1)}$

$d = (V + 8) \text{ km/h} \times 3\dfrac{1}{4}\text{ h}$

$= 3\dfrac{1}{4}(V + 8)$

$= \left(3\dfrac{1}{4}V + 26\right) \text{ km} \quad\text{——(2)}$

Equate (1) and (2):

$3\dfrac{3}{4}V = 3\dfrac{1}{4}V + 26$

$\dfrac{1}{2}V = 26$

$V = 26 \times 2$

$= \mathbf{52}$

Test 12: Arithmetical Problems

Section A

1. (a) $5\dfrac{1}{2}\%$ of 600 m

$= \dfrac{5\frac{1}{2}}{100} \times 600 \text{ m}$

$= \mathbf{33}\ \mathbf{m}$

(b) 3 hours = (3 × 60) minutes

= 180 minutes

$\text{Percentage required} = \dfrac{45}{180} \times 100\%$

$= \mathbf{25\%}$

(c) $12\dfrac{4}{5}\% = \dfrac{12\frac{4}{5}}{100}$

$= \dfrac{12.8}{100}$

$= \mathbf{0.128}$

2. (a) Cost of painting in 2004

= 115% of cost of painting in 2003

$\$690 = \dfrac{115}{100} \times \text{Cost in 2003}$

Cost in 2003

$= \dfrac{100}{115} \times \$690$

$= \mathbf{\$600}$

(b) Cost of camera after GST

= 105% of \$320

$= \dfrac{105}{100} \times \$320$

$= \mathbf{\$336}$

3. (a) Selling price = 120% of \$250

$= \dfrac{120}{100} \times \$250 = \mathbf{\$300}$

(b) Selling price = 120% of cost price

$\$456 = \dfrac{120}{100} \times \text{Cost price}$

$\text{Cost price} = \dfrac{100}{120} \times \$456 = \mathbf{\$380}$

(c) Profit = 20% of cost price

$\$24 = \dfrac{20}{100} \times \text{Cost price}$

$\text{Cost price} = \dfrac{100}{20} \times \$24$

$= \$120$

Selling price = Cost price + Profit

$= \$120 + \$24 = \mathbf{\$144}$

4. (a)   Cost price $= \$300$
Selling price $= 110\%$ of $\$300$

$$= \frac{110}{100} \times \$300$$
$$= \$330$$

(b) 75% of marked price $= \$330$

$$\frac{75}{100} \times \text{Marked price} = \$330$$

$$\text{Marked price} = \$330 \times \frac{100}{75}$$
$$= \$440$$

5.   Cost price $= 10 \times \$200$
$$= \$2000$$
Selling price $= (8 \times \$240) + (2 \times \$200)$
$$= \$1920 + \$400$$
$$= \$2320$$

$$\text{Percentage profit} = \frac{\text{Profit}}{\text{Cost price}} \times 100\%$$

$$= \frac{(\$2320 - \$2000)}{\$2000} \times 100\%$$

$$= \frac{\$320}{\$2000} \times 100\%$$

$$= 16\%$$

> Profit = Selling price – Cost price

6.
> **Teacher's Tip**
> Simple Interest $I = \frac{PRT}{100}$
> where $P = $ Principal,
> $R = $ Rate (per annum),
> $T = $ Time (in years)

$$I = \frac{PRT}{100}$$

$$\$280 = \frac{P \times 3.5 \times 5}{100}$$

$$P = \frac{280 \times 100}{3.5 \times 5}$$
$$= \$1600$$

∴ Helen must have **\$1600** in the bank.

7. (a)   S\$2.80 $= £1$

$$\text{S\$1} = £\frac{1}{2.80}$$

$$\text{S\$700} = 700 \times £\frac{1}{2.80}$$
$$= £250$$

> To convert from one currency to another, find the unit equivalent value of the first currency to the second.

(b)   Price of handphone after 10% discount

$$= \frac{90}{100} \times \$700$$
$$= \$630$$

S\$45 $=$ RM100

$$\text{S\$1} = \text{RM}\frac{100}{45}$$

$$\text{S\$630} = 630 \times \text{RM}\frac{100}{45}$$
$$= \text{RM1400}$$

8. 80% of cost price $= \$1280$

$$\frac{80}{100} \times \text{Cost price} = \$1280$$

$$\text{Cost price} = \frac{100}{80} \times \$1280$$
$$= \$1600$$

Selling price at a profit of 15%

$$= \frac{115}{100} \times \$1600$$
$$= \$1840$$

9. (a)   Chargeable income $=$ Total income $-$ Reliefs
$$= \$24\,800 - \$3200$$
$$= \$21\,600$$

(b) $\$21\,600 - \$10\,000 = \$11\,600$
Tax payable

$$= \left(\$10\,000 \times \frac{2}{100} \right) + \left(\$11\,600 \times \frac{5}{100} \right)$$
$$= \$200 + \$580$$
$$= \$780$$

10. (a) $20\% + 5\% = 25\%$
Selling price $= 75\%$ of $\$3400$

$$= \frac{75}{100} \times \$3400$$
$$= \$2550$$

(b)   Amount of deposit $= 10\%$ of $\$2550$

$$= \frac{10}{100} \times \$2550$$
$$= \$255$$

(c)   Cost of each monthly instalment

$$= \frac{\$2550 - \$255}{10}$$

$$= \frac{\$2295}{10}$$

$$= \$229.50$$

> **Section B**

11. (a) $I = \frac{PRT}{100}$

$$= \frac{\$2000 \times 6 \times 2}{100}$$
$$= \$240$$
Total amount $= \$2000 + \$240$
$$= \$2240$$

275

(ii) 1st year: Interest $= \$2000 \times \dfrac{6}{100}$

$= \$120$

Total amount after 1st year
$= \$2000 + \$120$
$= \$2120$

2nd year: Interest $= \$2120 \times \dfrac{6}{100}$

$= \$127.20$

Total amount after 2nd year
$= \$2120 + \$127.20$
$= \$2247.20$

Difference $= \$2247.20 - \$2240$
$= \$7.20$

Timothy will have **\$7.20** more than Melissa.

Alternative method:
Total amount after 2 years
$= [(\$2000 \times 1.06) \times 1.06]$
$= \$2247.20$
Difference $= \$2247.20 - \$2240$
$= \textbf{\$7.20}$

(b) $\$19\,965 = [(P \times 1.1) \times 1.1]$ [P = Principal]
$\$19\,965 = P \times 1.1^2$

$P = \dfrac{\$19\,965}{1.1^2}$

$= \$16\,500$

∴ George took a loan of **\$16 500.**

12. (a) (i)   S\$1.68 $=$ US\$1   [We need to pay S\$1.68 to buy US\$1 from the bank.]

S\$1 $=$ US\$$\dfrac{1}{1.68}$

S\$10 500 $=$ 10 500 $\times$ US\$$\dfrac{1}{1.68}$

$=$ US\$6250

S\$1.12 $=$ C\$1   [We need to pay S\$1.12 to buy C\$1 from the bank.]

S\$1 $=$ C\$$\dfrac{1}{1.12}$

S\$7350 $= 7350 \times$ C\$$\dfrac{1}{1.12}$

$=$ C\$6562.50

∴ he received **US\$6250** and **C\$6562.50** respectively.

(ii)   US\$1 $=$ S\$1.67   [We only get S\$1.67 for selling US\$1 to the bank.]
US\$6250 $= 6250 \times$ S\$1.67
$=$ S\$10 437.50

C\$1 $=$ S\$1.10   [We only get S\$1.10 for selling C\$1 to the bank.]
C\$6562.50 $= 6562.50 \times$ S\$1.10
$=$ S\$7218.75

Loss
$=$ S\$$[(10\,500 + 7350) - (10\,437.50 + 7218.75)]$
$=$ **S\$193.75**

(b) Value of car at the end of the 1st year
$= 85\%$ of \$95 000

$= \dfrac{85}{100} \times \$95\,000$

$= \$80\,750$

Value of car at the end of the 2nd year
$= 80\%$ of \$80 750

$= \dfrac{80}{100} \times \$80\,750$

$= \$64\,600$

13. (a) No. of faulty binders
$= 4\%$ of 200

$= \dfrac{4}{100} \times 200$

$= 8$

No. of binders left
$= 200 - 8 = 192$

Profit $= 80\%$ of \$16

$= \dfrac{80}{100} \times \$16$

$= \$12.80$

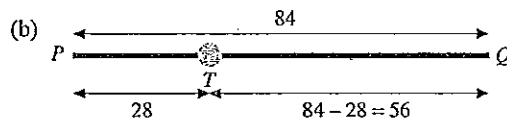No. of packets of binders

$= \dfrac{\$(16 + 12.80)}{\$3.60}$

$= \dfrac{\$28.80}{\$3.60}$

$= 8$

No. of binders in each packet

$= \dfrac{192}{8}$

$= 24$

(b)

Distance of PT after 8% increase

$= \dfrac{108}{100} \times 28$

$= 30.24$ cm

Distance of QT after decrease
$= 84 - 30.24$
$= 53.76$ cm

Percentage decrease

$= \dfrac{(56 - 53.76)}{56} \times 100\%$

$= 4\%$

14. (a)

> **Teacher's Tip**
> To calculate the percentage discount, find the amount he saved.

Amount saved
= $80 000 − $73 200
= $6800

Percentage discount

$= \dfrac{\$6800}{\$80\ 000} \times 100\%$

$= 8.5\%$

> **Teacher's Tip**
> The percentage discount is calculated based on the selling price, i.e. $80 000 and not on the amount paid, i.e. $73 200.

(b) (i) Amount paid by hire purchase
= $6800 + (60 × $1433.50) [5 yrs = 5 × 12 = 60 mths]
= $6800 + $86 010
≒ $92 810

Extra cost incurred
= $92 810 − $80 000
≒ **$12 810**

(ii) Principal, P = $80 000 − $6800
= $73 200

Interest, I = $12 810; Time, T = 5 yrs;
Rate, R = ?

$I = \dfrac{PRT}{100}$

$\$12\ 810 = \dfrac{\$73\ 200 \times R \times 5}{100}$

$R = \dfrac{\$12\ 810 \times 100}{\$73\ 200 \times 5}$

$= 3.5\%$

∴ the rate of interest charged per annum is **3.5%**.

> **Teacher's Tip**
> The extra cost incurred is the amount of interest to be paid through the hire purchase scheme. Interest is only charged on $73 200, i.e. after deducting the deposit.

15. (a) Total monthly basic salary in 2002
= 12 × $5750
= $69 000

Bonus received in 2002
= 0.85% of $1.2 million

$= \dfrac{0.85}{100} \times \$1\ 200\ 000$

= $10 200

Total income in 2002
= $69 000 + $10 200
≒ **$79 200**

(b) (i) Total basic salary in 2002 is $69 000.
Total basic salary in 2003
= 103.2% of $69 000

$= \dfrac{103.2}{100} \times \$69\ 000$

= **$71 208**

(ii) Bonus received in 2003
≒ $78 484 − $71 208
= $7276
0.85% — $7276

$100\% - \dfrac{100}{0.85} \times \$7276 = \$856\ 000$

∴ the value of the sales in 2003 is **$856 000**.
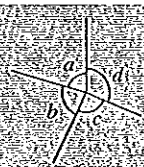
Test 13: Basic Geometrical Concepts and Properties

Section A

1. $90° + (3x° + 25°) + 23° + 7x° + 42° = 360°$ (∠s at
    $10x° + 180° = 360°$ a point)
    $10x° = 180°$
    $x° = \dfrac{180°}{10°}$
    $x° = 18°$
    ∴ $x = 18$

> **Teacher's Tip**
> The sum of angles at a point is 360°.
> $a + b + c + d = 360°$ (∠s at a pt)

2.
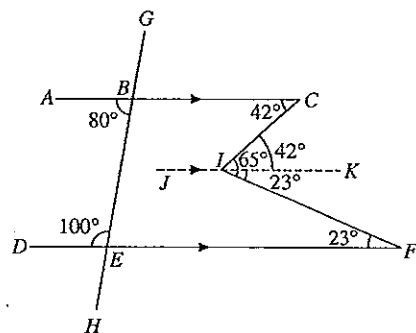
(a) Draw the line JK parallel to AC.
$C\hat{I}K = 42°$ (alt. ∠s, $AC \parallel JK$)
$K\hat{I}F = 65° - 42°$
$= 23°$
$D\hat{F}I = 23°$ (alt. ∠s, $JK \parallel DF$)

(b) $A\hat{B}E = 180° - 100°$ (int. ∠s, $AC \parallel DF$)
$= 80°$