

**SECTION A Core**

1	2	3	4	5	6	7	8	9	10	11	12	13
B	E	D	C	A	C	D	C	B	B	A	B	E

**SECTION B**

**Module 1: Number patterns and applications**

1	2	3	4	5	6	7	8	9
C	D	D	C	E	B	A	C	B

**Module 2: Geometry and trigonometry**

1	2	3	4	5	6	7	8	9
C	C	E	B	E	A	B	B	A

**Module 3: Graphs and relations**

1	2	3	4	5	6	7	8	9
A	E	C	C	D	E	B	E	A

**Module 4: Business-related mathematics**

1	2	3	4	5	6	7	8	9
D	B	B	A	B	C	A	D	E

**Module 5: Networks and decision mathematics**

1	2	3	4	5	6	7	8	9
C	D	B	B	A	C	D	C	B

**SECTION A Core**

- Q1 The speeds are already in order.  
 The median speed =  $\frac{62.8 + 62.6}{2} = 62.7$  km/h B
- Q2 7 out of 10,  $\therefore \frac{7}{10} \times 100\% = 70\%$  E
- Q3 The histogram has outliers and the median is on the left of the mode. D
- Q4 3 out of 30,  $\therefore \frac{3}{30} \times 100\% = 10\%$  C
- Q5 Mean number of mobiles =  $\frac{\sum xf}{\sum f} = \frac{0 \times 34 + 1 \times 78 + 2 \times 30 + 3 \times 12}{154} = 1.13$  A
- Q6 6.6 is one standard deviation less than 8.8. 68% within and 32% outside (less than + more than),  $\therefore$  16% less than 6.6 C
- Q7 Smaller interquartile range,  $\therefore$  less variable, and higher median,  $\therefore$  increase rate of growth. D
- Q8 Graphics calculator:  $r = 0.9681$  C
- Q9 Gradient of equation = 0.96 B
- Q10 x-coordinates in order: 1, 2, 3, 4, 5  $\therefore$  median x = 3.  
 y-coordinates in order: 0, 1, 2, 4, 5  $\therefore$  median y = 2.  
 $\therefore$  median point is (3,2). B
- Q11 A seasonal index of 1.1 means 0.1 or  $\frac{1}{10}$  above the yearly average.  $\therefore \frac{1}{10} \times 100\% = 10\%$ . A
- Q12 Share price =  $1.24 + 0.06 \times 48 = 4.12$  B
- Q13 Positive gradient: increasing linear trend; more fluctuations: increasing variability (volatility). E

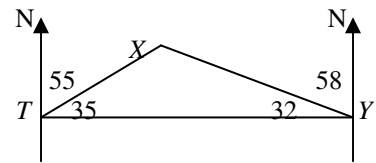
**Module 1: Number patterns and applications**

- Q1 Add 6 to get the next number, -5, 1, 7, 13, 19, 25, .....: C
- Q2 The first sequence has no common ratio, because  $\frac{1.11}{1.1} \neq \frac{1.111}{1.11}$ ,  $\therefore$  not geometric. The rest are geometric. D
- Q3  $1200 : x = 3 : 5$ ,  $\frac{1200}{x} = \frac{3}{5}$ ,  $\therefore x = \frac{5 \times 1200}{3} = 2000$  D
- Q4 The sum of the blocks in the towers forms an arithmetic series:  $3 + 5 + 7 + 9 + 11 = 35$ ,  $3 + 5 + 7 + 9 + 11 + 13 = 48$ ,  $3 + 5 + 7 + 9 + 11 + 13 + 15 = 63$ .  $\therefore$  only six towers following the pattern are possible with 50 blocks. C
- Q5  $S_{\infty} = \frac{a}{1-r} = \frac{80}{1-0.75} = \frac{80}{0.25} = 320$  E
- Q6 B
- Q7 The terms alternate between positive and negative values with magnitude decreasing exponentially.  $\therefore$  the sequence has a negative  $r$  and  $-1 < r < 0$ . A
- Q8 An arithmetic sequence has a common difference, i.e.  $t_{n+1} - t_n = d$ . When compare with  $t_{n+1} - at_n = b$ ,  $a = 1$  and  $b$  is the common difference that can be any value, say 2. C
- Q9  $P_n = 2P_{n-1} - 200$ ,  $\therefore P_{n-1} = \frac{1}{2}(P_n + 200)$ .

$\therefore P_5 = \frac{1}{2}(P_6 + 200) = \frac{1}{2}(1000 + 200) = 600$  and  
 $P_4 = \frac{1}{2}(P_5 + 200) = \frac{1}{2}(600 + 200) = 400$ . B

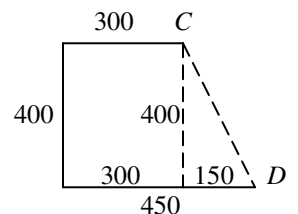
**Module 2: Geometry and trigonometry**

- Q1 Area =  $\frac{1}{2}(5)(10)\sin 25^\circ = 10.6$  cm<sup>2</sup>. C
- Q2  $\angle FOD = 2 \times 60^\circ = 120^\circ$  C
- Q3  $CB = 2\sqrt{14^2 - 8^2} = 23.0$  m E
- Q4 The cosine rule:  
 $AB = \sqrt{6^2 + 4^2 - 2(6)(4)\cos 30^\circ} = 3.2$  km B
- Q5



$\angle TXY = 180 - 35 - 32 = 113^\circ$  E

Q6  $CD = \sqrt{400^2 + 150^2} = 427$  m A



Q7 The sine rule:  $\frac{20}{\sin \alpha^\circ} = \frac{15}{\sin \beta^\circ}$ ,

$\therefore \sin \beta^\circ = \frac{15 \sin \alpha^\circ}{20} = \frac{15 \times 0.8}{20} = 0.6$

B

Q8 Enlarged area : original area

$= 2250 : 1440 = 225 : 144 = 15^2 : 12^2$ .

$\therefore$  enlarged length : original length  $= 15 : 12 = x : 36$ .

$\therefore \frac{x}{36} = \frac{15}{12}$ ,  $x = 45$  m

B

Q9  $HM = \sqrt{4^2 + 2^2} = 4.4721$ ,

$\tan \angle EMH = \frac{4}{4.4721}$ ,  $\angle EMH = 41.8^\circ$

A

### Module 3: Graphs and relations

Q1 A

Q2 Substitute  $y = -5$  in  $y = -x + 5$ ,  $-5 = -x + 5$ ,

$\therefore x = 10$ . The point is  $(10, -5)$

E

Q3  $3x + 5y = 0$ ,  $\therefore y = -\frac{3}{5}x$ ,

$\therefore$  the line has a negative gradient.

C

Q4 Substitute the coordinates of one of the intercepts in the

equation,  $3(8) + 2(0) = 4k$ ,  $\therefore k = 6$

C

Q5 Charge  $= 50 + 65n$

D

Q6 Let  $x$  be the price of ice cream and  $y$  the price of drink.

$4x + 3y = 21.40$  .....(1)

$5x + 2y = 20.80$  .....(2)

$5 \times (1) - 4 \times (2)$ ,  $7y = 23.80$ ,  $y = 3.40$

E

Q7 Gradient  $\frac{4-0}{2-0} = 2$ ,  $\therefore y = 2x$  or  $b = 2a^2$ .

B

Q8  $P = 4x - 3y$ , to maximise  $P$ ,  $x$  must be as large as possible

and  $y$  as small as possible.  $\therefore P$  is maximum at  $(120, 0)$ .

E

Q9  $I = \frac{k}{d^2}$ ,  $\therefore Id^2 = k = 20 \times 50^2 = 50000$ .

$I = \frac{k}{d^2}$  is not a straight line.

Since the point  $(5, 2000)$  on graph A satisfies  $Id^2 = 50000$ ,  $\therefore$  A

### Module 4: Business-related mathematics

Q1  $r = \frac{100 \times SI}{PT} = \frac{100 \times 140.38}{1200 \times 1} = 11.70$

D

Q2  $110\% \times x = 22$ ,  $1.10x = 22$ ,  $x = 20.00$

B

Q3

Withdrawals	Deposits	Balance
		2143.50
	2.45	2145.95
616.40		1529.55
	$x$	1971.75

$1529.55 + x = 1971.75$ ,  $\therefore x = 442.20$

B

Q4 Total number of boxes in two years  $= 2 \times 120000 = 240000$

Depreciated value  $= 45000 - 0.05 \times 240000 = 33000$

A

Q5  $A = PR^n - \frac{Q(R^n - 1)}{R - 1}$ , where  $A = 200000$ ,

$P = 200000$ ,  $n = 60$ ,  $R = 1 + \frac{8.5}{12 \times 100} = 1.0070833$ .

$Q = 1416.67$

B

Q6 Total at end of 3<sup>rd</sup> year  $= PR^n = 3000(1.065)^3 = 3623.85$

Total at end of 4<sup>th</sup> year  $= 3000(1.065)^4 = 3859.40$

$\therefore$  Interest in 4<sup>th</sup> year  $= 3859.40 - 3623.85 = 235.55$

C

Q7  $A = PR^n - \frac{Q(R^n - 1)}{R - 1}$ , where  $P = 10000$ ,  $n = 16$ ,  $Q = 500$ ,

$R = 1 + \frac{6}{4 \times 100} = 1.015$ .  $\therefore A = 3723.67$

A

Q8 Let  $P$  be the Monday's price.

Friday's price  $= P(110\%)(90\%)(120\%)(80\%)$

$= P(1.1)(0.9)(1.2)(0.8) = 0.95P = 95\%P$ ,  $\therefore$  5% lower than

Monday's price.

D

Q9 She has to pay interest on the missed third payment.

E

### Module 5: Networks and decision mathematics

Q1  $1 + 1 + 2 + 4 = 8$

C

Q2 D

Q3 B

Q4 Check by adding.

B

Q5 Euler's formula:  $V = E - F + 2$ ,

$10 = E - 3 + 2$ ,  $\therefore E = 11$ .

Number of edges removed  $= 15 - 11 = 4$ .

A

Q6 Maximum flow from X to Y = minimum cut.

Cut A  $= 2 + 3 + 5 + 5 + 7 = 22$

Cut B is a wrong cut.

Cut C  $= 6 + 5 + 7 = 18$

Cut D is a wrong cut.

Cut E  $= 6 + 18 = 24$ . Cut C is a minimum.

C

Q7 D because there are 3 ways from  $L$  to  $M$  without passing through the other towns, and only one way from  $M$  back to  $M$  without passing the other towns.

Q8 Find the critical path (the longest path) first.

$PSVXZ = 4 + 3 + 3 + 8 + 6 = 24$

$QTXZ = 5 + 6 + 8 + 6 = 25$

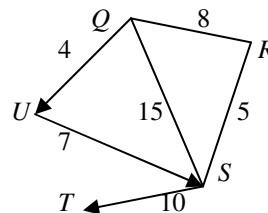
$RUXZ = 12 + 0 + 8 + 6 = 26$

$RWYZ = 12 + 4 + 3 + 6 = 25$

$\therefore RUXZ$  is the critical path. A delay in activity  $R$  will cause a delay in completion of the whole project.

C

Q9



The shortest route between  $Q$  and  $T$  is

$QUST = 4 + 7 + 10 = 21$

B

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