

Question 1 D 27 numbers Median is the middle number, i.e. 14th number from start is the median. Median = 131	Question 2 C LQ is the median of the numbers below the median LQ = 119 UQ is the median of the numbers above the median UQ = 144 IQR = UQ – LQ IQR = 144 – 119 IQR = 25
Question 3 B Height can be 165cm, 166cm and all values in between, therefore height is continuous. Taking all students in a class is not selecting the sample randomly. There are insufficient students in the sample to give a bell shaped curve.	Question 4 C Christmas sales happen at a certain time of the year pushing prices up at that time beyond sales at other times of the year.
Question 5 E $2 + 5 + 7 + 10 + 12 + 9 + 7 + 4 + 3 + 1 = 60$	Question 6 B No. who watch more than 25 hrs of TV/week = 24 $(9 + 7 + 4 + 3 + 1) = 24$ $\% = \frac{24}{60} \times 100 = 40\%$
Question 7 A This is bivariate data, therefore use scatter plot	Question 8 D Correlation coefficient does not predict cause. Positive correlation means that as one variable increases the other variable also increases. Coefficient of determination = $r^2 = 0.92^2 = 0.8464$ which is approximately 85%. This explains the variation of one variable with regard to the other.
Question 9 A Using graphics calculator, go to Stat Edit and enter data. Then go to Stat Calc Linear Regression. $y = ax + b$ so Unemployment Rate = $-1.3 \times \text{rate of inflation} + 20.7$	Question 10 E Unemployment Rate = $20.7 - 1.3 \times \text{rate of inflation}$ $1.3 \times \text{rate of inflation} = 20.7 - \text{unemployment rate}$ $1.3 \times \text{rate of inflation} = 20.7 - 9.5$ $1.3 \times \text{rate of inflation} = 11.2$ $\text{rate of inflation} = 11.2 \div 1.3$ $\text{rate of inflation} = 8.6\%$

Question 11 B

Residual is the difference in the y values
between the predicted and the actual values.

$$\text{Predicted } y \text{ value} = 0.64 \times 82.4 + 31.2$$

$$\text{Predicted } y \text{ value} = 83.94$$

$$\text{Actual } y \text{ value} = 89.8$$

$$\text{Residual} = 89.8 - 83.94$$

$$\text{Residual} = 5.9$$

Question 12 D

$$t_L = 2, y_L = 79$$

$$t_U = 8, y_U = 93$$

$$m = \frac{y_U - y_L}{t_U - t_L} = \frac{93 - 79}{8 - 2} = \frac{14}{6} = 2.3$$

Question 13 D

Average of the 4th to 7th motel occupancy figures is $(1564 + 3485 + 3792 + 3520) \div 4 = 3090.25$

Average of 5th to 8th motel occupancy figures is $(3485 + 3792 + 3520 + 2612) \div 4 = 3352.25$

Centred moving average = $(3090.25 + 3352.25) \div 2 = 3221.25$

Question 1 E This is an arithmetic sequence with $a = 6$ and $d = -3$ $t_n = a + (n - 1)d$ $t_n = 6 + (n - 1)(-3)$ $t_n = 6 - 3n + 3$ $t_n = 9 - 3n$ $S_n = \frac{n}{2}[2a + (n - 1)d]$ $S_5 = \frac{5}{2}[12 + (4)(-3)]$ $S_5 = \frac{5}{2}[12 - 12]$ $S_5 = \frac{5}{2} \times 0$ $S_5 = 0$	Question 2 B $a = 18, d = 152$ $t_n = a + (n - 1)d$ $t_{16} = 18 + (16 - 1) \times 152$ $t_{16} = 18 + 15 \times 152$ $t_{16} = 2298$
Question 3 B This is a linear graph $\therefore$ an arithmetic sequence. It has a negative gradient $\therefore d$ is negative i.e. $d < 0$	Question 4 B $S_\infty = \frac{a}{1 - r}$ $a = 18, r = \frac{12}{18} = \frac{2}{3}$ $S_\infty = \frac{18}{1 - \frac{2}{3}}$ $S_\infty = \frac{18}{\frac{1}{3}}$ $S_\infty = 54$
Question 5 A $t_1 = 1$ $t_2 = t_{1+1} = 4t_1 - 1$ $t_2 = 4 - 1 = 3$ $t_3 = t_{2+1} = 4t_2 - 1 = 4 \times 3 - 1 = 11$ $t_4 = t_{3+1} = 4t_3 - 1 = 4 \times 11 - 1 = 43$ $\therefore$ sequence is 1, 3, 11, 43....	Question 6 C Total number of shares = $3 + 4 + 5 = 12$ Kim receives $\frac{3}{12} = \frac{1}{4}$ $\frac{1}{4} = \\$120,000$ $\frac{4}{4} = \\$480,000 = \text{total inheritance}$

Question 7 C

$$203 + 210 + 217 + \dots 497$$

$$n = \frac{497 - 203}{7} + 1 = \frac{294}{7} + 1 = 42 + 1 = 43$$

$$S_n = \frac{n}{2} [a + l]$$

$$S_n = \frac{43}{2} [203 + 497]$$

$$S_n = 15050$$

Question 8 D

$$\text{Sequence: } 36,000 \quad (0.85)36,000 \quad (0.85)^2 36,000$$

Let number of years = n

$$36,000 (0.85)^n < 18000$$

$$(0.85)^n < 0.5$$

$$n \log(0.85) < \log(0.5)$$

$$n (-0.07058) < -0.30103$$

$$n > 4.265$$

$$n = 5$$

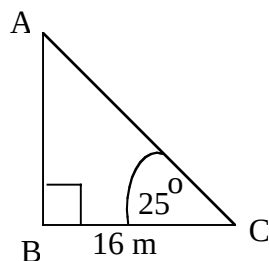
5 years after 2002 is 2007

Question 9 B

For every one turn of B, A goes around 2.5 times

$\therefore$ ratio is $2.5 : 1 = 5 : 2$

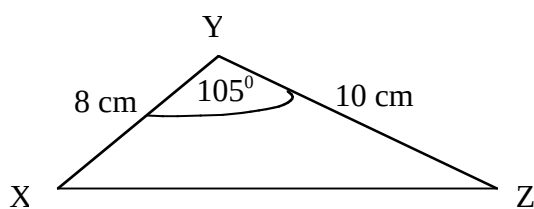
Question 1 B



$$\tan 25^\circ = \frac{AB}{16}$$

$$AB = 16 \tan 25^\circ = 7.46 \text{ m}$$

Question 2 D



$$\text{Area} = \frac{1}{2} xz \sin Y$$

$$= \frac{1}{2} \times 8 \times 10 \times \sin 105^\circ$$

$$= 38.64 \text{ cm}^2$$

Question 3 C

$$\angle ABC = 180^\circ - (70^\circ + 42^\circ)$$

$$\angle ABC = 180^\circ - 112^\circ$$

$$\angle ABC = 68^\circ$$

$$\frac{9}{\sin 68^\circ} = \frac{BC}{\sin 70^\circ}$$

$$BC = \frac{9 \sin 70^\circ}{\sin 68^\circ}$$

$$BC = 9.12 \text{ cm}$$

Question 4 C

$$V = \pi R^2 H$$

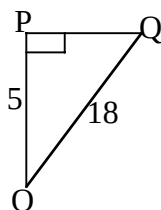
$$V_1 = \pi (2R)^2 \frac{1}{2} H$$

$$V_1 = \pi 4R^2 \frac{1}{2} H$$

$$V_1 = 2\pi R^2 H$$

so the volume is doubled

Question 5 C



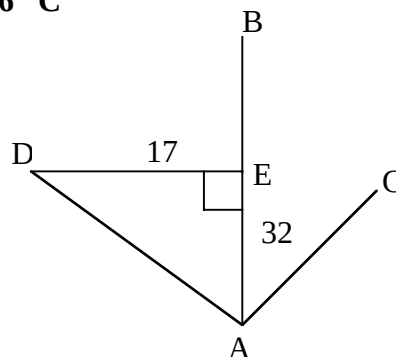
$$5^2 + PQ^2 = 18^2$$

$$PQ^2 = 299$$

$$PQ = \sqrt{299}$$

$$PQ = 17.29$$

Question 6 C

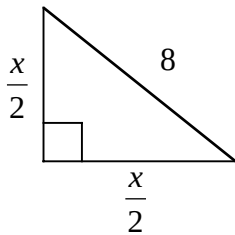


$$AD^2 = 32^2 + 17^2$$

$$AD^2 = 1313$$

$$AD = \sqrt{1313}$$

$$AD = 36.2 \text{ m which is closest to 36 m}$$

Question 7 B

$$\left(\frac{x}{2}\right)^2 + \left(\frac{x}{2}\right)^2 = 64$$

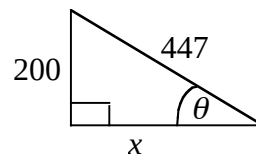
$$\frac{x^2}{4} + \frac{x^2}{4} = 64$$

$$\frac{x^2}{2} = 64$$

$$x^2 = 128$$

$$x = \sqrt{128}$$

$$x = 11.31$$

Question 8 B

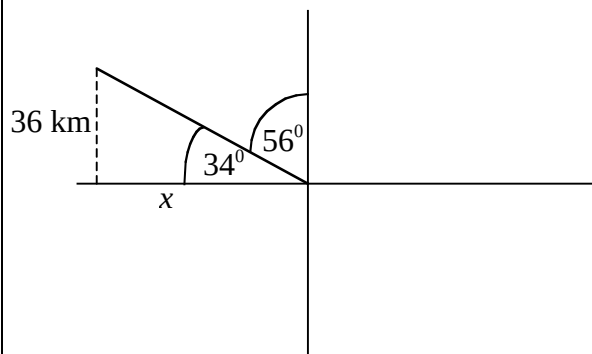
Using Pythagoras' Theorem,

$$x = \sqrt{447^2 - 200^2}$$

$$x = 399.76$$

$$m = \tan \theta = \frac{200}{399.76}$$

$$m = 0.5$$

Question 9 E

$$90^\circ - 56^\circ = 34^\circ$$

$$\tan 34^\circ = \frac{36}{x}$$

$$x = \frac{36}{\tan 34^\circ}$$

$$x = 53.37 \text{ km}$$

Question 1 E gradient = $\frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{9 - 5}{6 - (-2)} = \frac{9 - 5}{6 + 2} = \frac{4}{18} = \frac{1}{2}$ $y = \frac{1}{2}x + c$ $5 = -1 + c$ $6 = c$ $y = \frac{1}{2}x + 6$ $2y = x + 12$ $2y - x - 12 = 0$	Question 2 A $y = kx^2$ Taking any group of 2 values for $x = 6$ and y, say (2,6) When $y = 6, x^2 = 4$ $6 = k \times 4$ $k = 6 \div 4 = 1.5$
Question 3 A Lowest tide at 1.00 pm. Next highest tide at 6.00 pm. Time between these two events = 5 hours	Question 4 C From 10.00 am to 3.00 pm = 5 hours
Question 5 C Between 9.00 am and 10.00 am the water level falls about 2 m, which is the greatest fall in a one hour period out of the given alternatives.	Question 6 D $y = \frac{2}{x^2}$ is always positive for all values of x
Question 7 D Point of intersection of the two graphs is (40, 700) The x coordinate is the number of calculators sold $\therefore 40$ must be sold to break even.	Question 8 E The revenue is only greater than the cost when $x > 40$. In region A the cost is greater so this area represents a loss. The fixed cost is the intercept with the y axis which is between \$500 and \$1000. When more than 40 calculators are sold a profit is made.
Question 9 D $Z = 3x - y$ At P (0,20) $Z = 0 - 20 = -20$ At Q (0,50) $Z = 0 - 50 = -50$ At R (40,60) $Z = 120 - 60 = 60$ At S (70,0) $Z = 210 - 0 = 210$ At T (40,0) $Z = 120 - 0 = 120$	

Question 1 D $I = \frac{PRT}{100}$ $I = \frac{50,000 \times 10 \times 3}{100}$ $I = 15,000$ $\text{Total} = 50,000 + 15,000$ $\text{Total} = \$65,000$	Question 2 C Amt. paid per year = 480×12 Amt. paid over 8 years = $480 \times 12 \times 8$ Amt. paid over 8 years = \$46,080 Interest = $46,080 - 20,000$ Interest = \$26,080
Question 3 E $I = \frac{PRT}{100}$ $26,080 = \frac{20,000 \times R \times 8}{100}$ $2608 = 160R$ $R = 2608 \div 160$ $R = 16.3\%$	Question 4 A Effective rate of interest $= \frac{2n}{n+1} \times \text{flat rate}$ $= \frac{2 \times 20}{20+1} \times 8$ $= \frac{40}{21} \times 8$ $= 15.2\%$
Question 5 C Compounding depreciation is not linear. The depreciation rate will be greater at first and become less and less with time. The rate is the gradient of the graph.	Question 6 C $P = 5000$ $r = 12\% \text{ per annum} = 3\% \text{ per quarter}$ $n = 2 \text{ years} = 8 \text{ quarters}$ $A = PR^n$ $A = 5000 \times \left(1 + \frac{3}{100}\right)^8$ $A = 6333.85$ $I = A - P$ $I = 6333.85 - 5000$ $I = \$1333.85$

Question 7 C

Month	Minimum Monthly Balance	Interest
December	\$9960	$\frac{4}{12}\%$ of 9960 = \$33.20
January	\$12231	$\frac{4}{12}\%$ of 12231 = \$40.77
February	\$12231	$\frac{4}{12}\%$ of 12231 = \$40.77

Total interest = 33.20 + 40.77 + 40.77 = \$114.74

Question 8 D

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

$$0 = 12000 \times 1.06^n - \frac{3000(1.06^n - 1)}{0.06}$$

$$0 = 12 \times 1.06^n - 50(1.06^n - 1)$$

$$50(1.06^n - 1) = 12 \times 1.06^n$$

$$1.06^n(50 - 12) = 50$$

$$1.06^n \times 38 = 50$$

$$1.06^n = 1.3158$$

$$n \log 1.06 = \log 1.3158$$

$$n \times 0.02531 = 0.1192$$

$$n = 4.7$$

The 5th year after 2002 is 2007

Question 9 A

Bank loan = \$230,000 - \$80,000 = \$150,000

$P = 150000$, $A = 0$, $n = 20 \times 12 = 240$, $R = 1.005$

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

$$0 = PR^n - \frac{Q(R^n - 1)}{R - 1}$$

$$PR^n = \frac{Q(R^n - 1)}{R - 1}$$

$$150000 \times (1.005)^{240} = \frac{Q(1.005^{240} - 1)}{0.005}$$

$$496530.67 = \frac{Q \times 2.31}{0.005}$$

$$2482.65 = Q \times 2.31$$

$$Q = 1074.74$$

$Q = \$1075$ to the nearest dollar.

Question 1 C

A connected planar graph does not have edges which cross and is not comprised of two separate groups.

Euler's rule is $v + f = e + 2$

Question 2 A

There are exactly two odd degree vertices and the rest of the vertices are even. Hence an Euler path exists but not an Euler circuit.

Question 3 E

Judd does read science fiction and historical novels

Jane does not read detective novels

Jane, John and Judd read science fiction

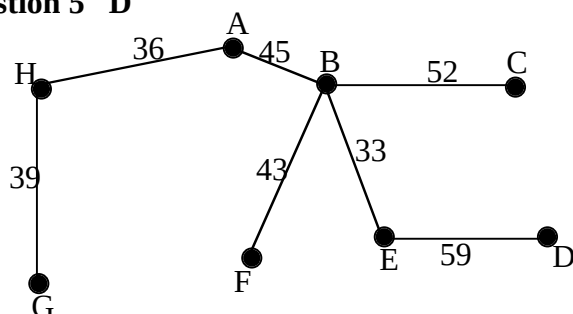
Jane reads three types of books while John and

Judd read two kinds of books

Only John reads detective novels

Question 4 C

A Hamiltonian Circuit exists when you draw a line passing through each node only once, beginning and ending on the same node. This can only be done for diagram C

Question 5 D

$$\text{Total} = 39 + 36 + 45 + 43 + 33 + 52 + 59 = 307$$

Question 6 E

Select a zero from each row. This means Ron will weed, Raymond will plant and so Ruth will prune.

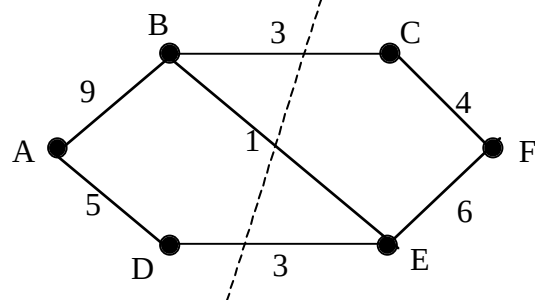
Question 7 C

There is 1 path from A to A, 1 path from A to B, 2 paths from A to C and 0 paths from A to D. Hence, the only possible answers looking at the first row of each matrix are C and E. There is 1 path from B to A, 0 paths from B to B, 2 paths from B to C, and 0 paths from B to D. Hence, the answer is C since E does not have these elements for the second row.

Question 8 C

Maximum flow = minimum cut capacity

Maximum flow = $3 + 1 + 3 = 7$

**Question 9 A**

Float time = latest possible start time – earliest possible start time.

A critical path is ACEFG.

Earliest time G can start is day 11.

Latest time G can start is day 11.

Float time = $11 - 11 = 0$

End of suggested solutions 2002 Further Mathematics Trial Examination 1

KILBAHA PTY LTD (Publishers in Education)
PO BOX 2227 KEW VIC 3101
AUSTRALIA

TEL: (03) 9817 5374
FAX: (03) 9817 4334
chemas@chemas.com
www.chemas.com