

B O A R D O F S T U D I E S
NEW SOUTH WALES

2012 HSC General Mathematics 'Sample Answers'

When examination committees develop questions for the examination, they may write 'sample answers' or, in the case of some questions, 'answers could include'. The committees do this to ensure that the questions will effectively assess students' knowledge and skills.

This material is also provided to the Supervisor of Marking, to give some guidance about the nature and scope of the responses the committee expected students would produce. How sample answers are used at marking centres varies. Sample answers may be used extensively and even modified at the marking centre OR they may be considered only briefly at the beginning of marking. In a few cases, the sample answers may not be used at all at marking.

The Board publishes this information to assist in understanding how the marking guidelines were implemented.

The 'sample answers' or similar advice contained in this document are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

Section II

Question 26 (a) (i)

Sample answer:

$$10 \times 10 \times 10 = 1000$$

Question 26 (a) (ii)

Sample answer:

$$\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$$

Question 26 (b)

Sample answer:

$$r = 15\% \quad n = 3 \quad V_0 = 22\,000$$

$$\begin{aligned} S &= V_0(1-r)^n \\ &= 22\,000(1-0.15)^3 \\ &= \$13\,510.75 \end{aligned}$$

Question 26 (c)

Sample answer/Answers could include:

$$\begin{aligned} \$1990 \times \frac{23}{365} \times 0.2 &= \$25.079\ 452\ 05 \\ &= \$25.08 \end{aligned}$$

Question 26 (d) (i)

Sample answer:

- B 1) Posing questions
- E 2) Collecting data
- C 3) Organising data
- F 4) Summarising and displaying data
- D 5) Analysing data and drawing conclusions
- A 6) Writing a report

Question 26 (d) (ii)

Sample answer:

- F Summarising and displaying data

Question 26 (e) (i)*Sample answer:*

$$\frac{7}{13}$$

Question 26 (e) (ii)*Sample answer:*

Yes, because new $P = \frac{7}{14}$ or The denominator has changed.

Question 26 (f)*Sample answer:*

$$\frac{60}{n} = \frac{30}{120}$$
$$\therefore n = 240$$

$$89\% = 240$$

$$100\% = 269.7$$

\therefore The population would have been 270 in 2008.

Question 26 (g)*Sample answer:*

$$\begin{aligned}\text{Number of cups per week} &= 3 + 6 \\ &= 9 \text{ cups}\end{aligned}$$

$$\begin{aligned}\text{Number of grams per week} &= 9 \times 250 \text{ g} \\ &= 2250 \text{ g}\end{aligned}$$

$$\begin{aligned}\text{Number of weeks} &= \frac{35\,000}{2250} \\ &= 15\frac{5}{9}\end{aligned}$$

\therefore Container will last 15 full weeks.

Question 27 (a)*Sample answer:*

$$\begin{aligned}\text{Net pay} &= 1024 - 296.40 - 24.50 - 15.80 \\ &= \$687.30\end{aligned}$$

$$\begin{aligned}\text{Household expenses per week} &= 3640 \div 52 \\ &= \$70\end{aligned}$$

$$\begin{aligned}\% \text{ of net pay} &= \frac{70}{687.30} \times 100\% \\ &= 10.18\%\end{aligned}$$

Question 27 (b)*Sample answer:*

$$\begin{aligned}\text{Perimeter} &= \text{arc length} + 2 \text{ radii} \\ &= \frac{230}{360} \times 2 \times \pi \times 13 + 2 \times 13 \\ &= 78.185\ 34 \\ &= 78 \text{ cm (to nearest cm)}\end{aligned}$$

Question 27 (c) (i)*Sample answer:*

$$1 : 500\,000$$

$$2 \text{ cm} : 2 \times 500\,000 \text{ cm}$$

$$1\,000\,000 \text{ cm} = 10 \text{ km}$$

Question 27 (c) (ii)*Sample answer:*

$$1 : 500\,000$$

$$x \text{ km} : 75 \text{ km}$$

$$x = \frac{75}{500\,000} \times 1000 \times 100 \text{ cm}$$

$$= 15 \text{ cm}$$

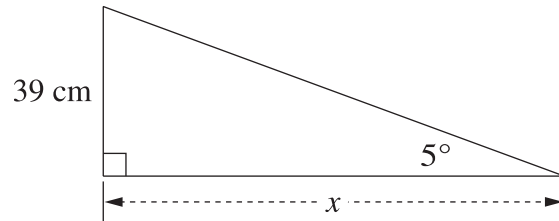
Question 27 (d)**Sample answer:**

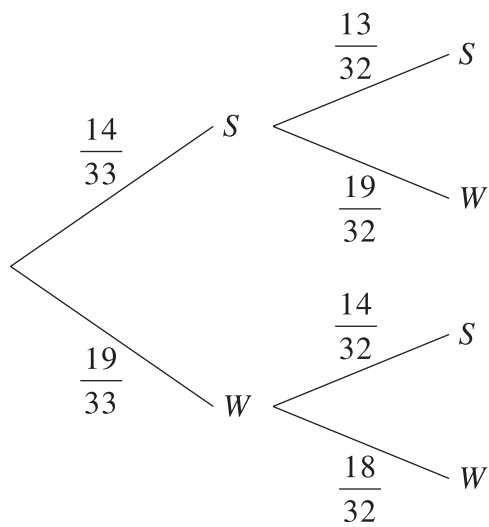
$$\begin{aligned}\text{Height of steps} &= 3 \times 13 \\ &= 39 \text{ cm}\end{aligned}$$

$$\tan 5^\circ = \frac{39}{x}$$

$$\therefore x = \frac{39}{\tan 5^\circ}$$

$$\begin{aligned}\therefore d &= \frac{39}{\tan 5^\circ} - 2 \times 30 \\ &= 445.772\dots - 60 \\ &= 385.772\dots \\ &= 386 \text{ cm (to nearest cm)}\end{aligned}$$



Question 27 (e) (i)*Sample answer:***Question 27 (e) (ii)***Sample answer:*

$$\begin{aligned}P(SS) &= \frac{14}{33} \times \frac{13}{32} \\ &= \frac{182}{1056} \\ &= \frac{91}{528}\end{aligned}$$

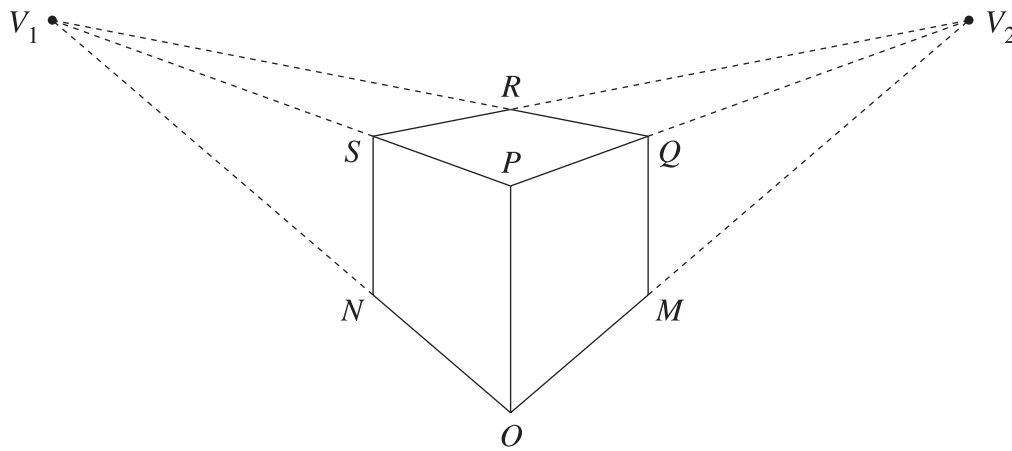
Question 27 (e) (iii)

Sample answer:

$$\begin{aligned}
 P(\text{different}) &= \frac{14}{33} \times \frac{19}{32} + \frac{19}{33} \times \frac{14}{32} \\
 &= \frac{133}{264}
 \end{aligned}$$

Question 28 (a)

Sample answer:


Question 28 (b)

Sample answer:

$$\frac{6abc}{a^2b} \times \frac{c}{b} = \frac{6c}{a}$$

For one mark $\frac{6abc}{a^2b}$

Question 28 (c)*Sample answer:*

$$\begin{aligned}\text{Ratio of heights} &= 4 : 1.5 \\ &= 40 : 15 \\ &= 8 : 3\end{aligned}$$

$$\therefore \text{Ratio of shadows} = 8 : 3$$

Let Jacques' shadow be d

$$\therefore \frac{d+3}{d} = \frac{8}{3}$$

$$\therefore 3(d+3) = 8d$$

$$3d+9 = 8d$$

$$5d = 9$$

$$d = \frac{9}{5}$$

 \therefore Jacques' shadow is 1.8 m

Question 28 (d) (i)*Sample answer:*

$$80 - 50 = 30$$

Question 28 (d) (ii)*Sample answer:*

The interquartile range is larger for English than for Mathematics.

Both are negatively skewed.

English has a greater range than Mathematics.

Median for Mathematics is higher than the median for English.

Question 28 (e)*Sample answer:*

$$\text{Price} = \$2800$$

$$\begin{aligned}\text{Deposit} &= 0.10 \times 2800 \\ &= 280\end{aligned}$$

$$\begin{aligned}\text{Balance} &= 2800 - 280 \\ &= 2520\end{aligned}$$

$$\begin{aligned}\text{Repayments} &= 95.20 \times 3 \times 12 \\ &= 3427.20\end{aligned}$$

$$\begin{aligned}\text{Interest} &= 3427.20 - 2520 \\ &= 907.20\end{aligned}$$

$$I = Pnr$$

$$907.20 = 2520 \times 3 \times r$$

$$\frac{907.20}{2520 \times 3} = r$$

$$0.12 = r$$

$$\therefore \text{Annual flat rate} = 12\%$$

Question 29 (a) (i)*Sample answer:*

70 minutes

Question 29 (a) (ii)*Sample answer:*

3 minutes

Question 29 (a) (iii)*Sample answer:*

The longer the eruption, the longer the time to wait for the next eruption.

Question 29 (b)*Sample answer:*

$$6.000 - 5.950 = 0.050 > 0.040$$

$$6.000 - 5.983 = 0.017 < 0.040$$

$$6.140 - 6.000 = 0.140 > 0.040$$

∴ Two nails lie outside one standard deviation of the mean.

∴ The machine needs to be checked.

Question 29 (c) (i)*Sample answer:*

$$\frac{EF}{\sin 10^\circ} = \frac{82}{\sin 139^\circ}$$

$$\begin{aligned} EF &= \frac{82 \times \sin 10^\circ}{\sin 139^\circ} \\ &= 21.704\ 069\ 21 \\ &= 22 \text{ km} \end{aligned}$$

Question 29 (c) (ii)*Sample answer:*Let $EH = GH = x$

$$\begin{aligned} 2x^2 &= 82^2 \\ x &= \sqrt{\frac{82^2}{2}} \\ &= 57.982\ 756\ 06 \end{aligned}$$

$$\begin{aligned} \text{Length of course} &= 21.704\ 069\ 21 + 64 + 2 \times 57.982\ 756\ 06 \\ &= 201.669\ 583\ 1 \\ &= 202 \text{ km} \end{aligned}$$

Question 29 (d) (i)*Sample answer:*

$$\begin{aligned}\text{Monthly contribution} &= 0.05 \times \frac{81\,600}{12} \\ &= \$340\end{aligned}$$

Question 29 (d) (ii)*Sample answer:*

$$\begin{aligned}\text{Accumulated value} &= \frac{M\left((1+r)^n - 1\right)}{r} & r &= \frac{0.066}{12} \\ & & &= 0.0055 \\ &= \frac{340\left((1.0055)^{156} - 1\right)}{0.0055} & n &= 13 \times 12 \\ &= \$83\,633.89 & &= 156\end{aligned}$$

Question 30 (a)*Sample answer:*

$$\left. \begin{array}{l} \text{Ship } 4^{\circ}\text{N } 160^{\circ}\text{E} \\ \text{Moniara } 9^{\circ}\text{S } 160^{\circ}\text{E} \end{array} \right\} 13^{\circ} \text{ travel}$$

$$\begin{aligned} \text{Distance} &= 13 \times 60 \text{ nautical miles} \\ &= 780 \text{ nautical miles} \end{aligned}$$

$$\text{Speed} = 30 \text{ knots} = 30 \text{ nautical miles per hour}$$

$$\text{Time} = \frac{780}{30} \text{ hours} = 26 \text{ hours}$$

Question 30 (b) (i)*Sample answer:*

40 m

Question 30 (b) (ii)*Sample answer:*As $h = 35$ $d = 30, 170$

$$\begin{aligned}\therefore \text{Distance} &= 170 - 30 \\ &= 140 \text{ m}\end{aligned}$$

Question 30 (b) (iii)*Sample answer:*From graph, when $d = 250$, $h = 17.5$ m**Question 30 (b) (iv)***Sample answer:*

$$0 \leq d \leq 300$$

Graph is invalid for $d < 0$ or $d > 300$.

Question 30 (c) (i)*Sample answer:*

6 600 000

Question 30 (c) (ii)*Sample answer:*

The population in 2010

Question 30 (c) (iii) (1)*Sample answer:*1.05 gives a steeper curve than $P = A(1.04)^n$.**Question 30 (c) (iii) (2)***Sample answer:*

$$\begin{aligned} \text{1st estimate } b = 1.03 &\Rightarrow 3\,000\,000 \times 1.03^{20} \\ &= 5\,418\,000 \end{aligned}$$

$$\begin{aligned} \text{2nd estimate } b = 1.02 &\Rightarrow 3\,000\,000 \times 1.02^{20} \\ &= 4\,457\,800 \end{aligned}$$

$$\therefore b = 1.02$$

Question 30 (iv)***Sample answer:***

$$\begin{aligned} P &= 3\,000\,000(1.02)^{40} \\ &= 6\,624\,000 \text{ (to four significant figures)} \end{aligned}$$

\therefore Population will be less than 7 000 000
so this model will work.