GENERAL MATHEMATICS

BOS 2001 HSC Specimen Paper

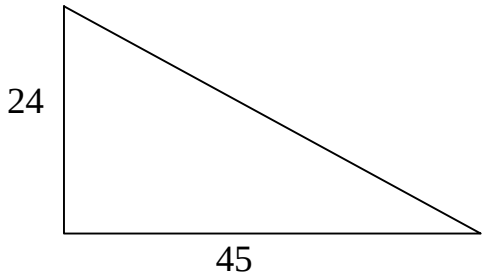
Multiple Choice Section

1

$$v = u + at$$
$$= 8 + 10(5)$$
$$= 8 + 50$$
$$\therefore v = 58$$

Answer: (B)

2 $x^2 = 24^2 + 45^2$
$= 576 + 2025$
$= 2601$
$\therefore x = \sqrt{2601}$
$= 51cm$

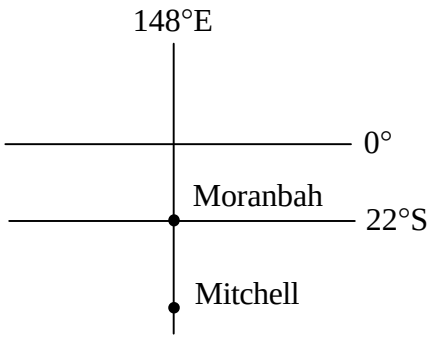


Answer: (C)

3 Discrete

Answer: (A)

4 Both lie on 148^0E (same longitude)
Mitchell must be further south ∴ 26°S 148°E



Answer: (D)

5 Tax payable
= 8.2($1000)
= $8200

Answer: (C)

6 Sending parcels separately at 400 g each:
$4 \times \$1.50$
$= \$6.00$
Sending parcels together:
$400g \times 4$
$= 1600g$
$= \$2.50$
Money Saved = $6.00 - $2.50
= $3.50

Answer: (C)

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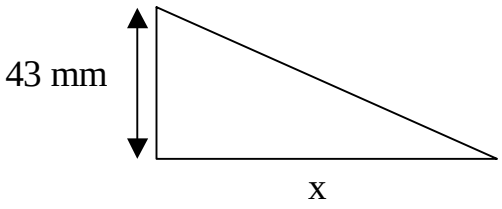
7 Let N be the required number of students in Year 8.

$$\frac{\text{Number of Year 8 Students}}{\text{Total number of Students}}$$
$$= \frac{120}{600} = \frac{N}{100}$$
$$\Rightarrow \frac{1}{5} = \frac{N}{100}$$
$$\therefore 5N = 1(100)$$
$$N = \frac{100}{5} = 20$$

Answer: (B)

8 Let x be the required distance on the diagram.



$$\frac{\text{Pole length}}{\text{Shadow length}} = \frac{15m}{25} = \frac{43}{x}$$
$$\therefore 15x = 25 \times 43$$
$$x = \frac{25 \times 43}{15} = 71.7mm$$

Answer: (C)

9 In diagram **A**, blue occupies 2 quadrants, green occupies 1
\ the spinner is twice more likely to stop in Green. **Answer: (A)**

10

Gradient of l:
$$\frac{Y_2 - Y_1}{X_2 - X_1} = \frac{6-3}{12-0} = \frac{3}{2} = \frac{1}{4}$$
y intercept of $l = 3$
Equation of l is in the form
$$y = mx + b$$
$$\therefore y = \frac{x}{4} + 3$$

Answer: (A)

11

$$A \approx \frac{h}{3}(d_f + 4d_m + d_l)$$
$$= \frac{130}{3}[90 + 4(100) + 30]$$
$$= \frac{130}{3}[90 + 400 + 30]$$

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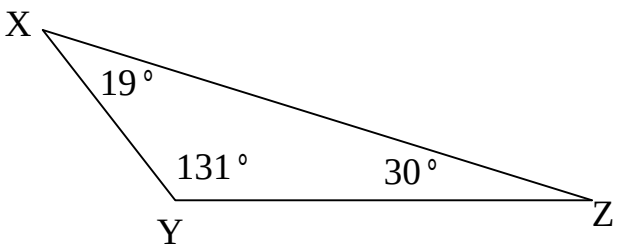
Answer: (A)

12



To find side *YZ*:

$$\frac{15}{Sin131^\circ} = \frac{YZ}{Sin19^\circ}$$

$$\therefore \text{Side } YZ = \frac{15}{Sin131^\circ} \times Sin19^\circ$$

Hence, formula (D) would be most useful in calculating side YZ.

Answer: (D)

13

Time of loan = 20 years
= 20 years $\times$12 months
= 240 months

Monthly payment = \$107.46, from table

\ total repayments = \$107.46 ´ 240 = \$25 790.4

Interest = \$25 790.4 - \$15 000

= \$10 790.4 **Answer: (C)**

14

For example:
Consider the following sets of values (each of the second group is 4 more than the former).

A: 12, 10, 8, 7, 10
$\bar{x} = 9.4$
$s = 1.74$

B: 16, 14, 12, 11, 14
$\bar{x} = 13.4$
$s = 1.74$

Mean has increased by 4 and standard deviation remains the same.

Answer: (D)

15

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$10(x+3)-2(4x+2)$
$=10x+30-8x-4$
$=2x+26$

Answer: (B)

16

$\text{Sale price} = \$1494$

$\text{Deposit} = \frac{1}{3}\times 1494 = \$498$

$\text{Balance} = \$1494 - \$498 = \$996$

$$\text{Monthly Payments} = \frac{\$996}{24 \text{ months}}$$
$$= \$41.50$$

Answer: (B)

17

Area of shaded cross-section
= Area (outer diameter) - Area (inner diameter)
$= p10^2 - p7^2$
$= p\left(10^2 - 7^2\right)$

Answer: (B)

18 **Answer (A)**

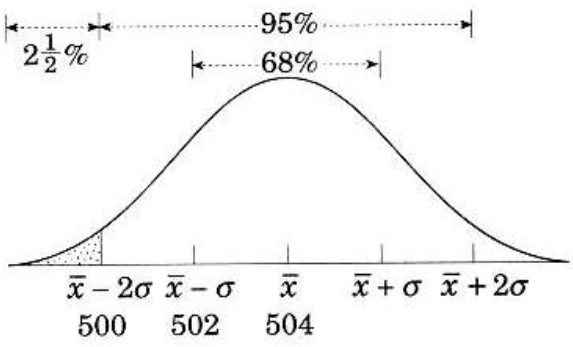
19

$\frac{5}{50}\times\frac{4}{49}$

Answer: (B)

20

Consider a normal distribution diagram, with $\bar{x} = 54,\ s = 2$.
For a normal distribution, approximately 95% of the sample lies within two standard deviations of the mean. The remainder (5%) is 'split' equally i.e.
$2\frac{1}{2}\%$ below $\bar{x} - 2s$ and $2\frac{1}{2}\%$ above $\bar{x} + 2s$.



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The percentage below 500 (i.e. $\bar{x}-2s$) is $2\frac{1}{2}\%$. **Answer: (B)**

21 Number of combinations
= 6(5)/2
= 15

Answer: (B)

22

stopping distance $= d$

square of car's speed $= s^2$

$d \propto s^2$

$d = ks^2$

$40 = k(60^2) = 3600k$

$\therefore k = \frac{1}{90}$

Substitute k into equation:

$d = ks^2$

$80 = \frac{s^2}{90}$

$\therefore s^2 = 80 \times 90 = 7200$

$s = \sqrt{7200} = 84.9 km/hr$

Answer: (C)

23

a) $3\times10^5 km/s$

$3\times10^5 \times 1000 m/s$

$3\times10^5 \times10^3 m/s$

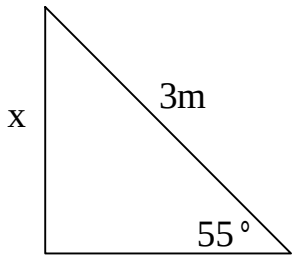
$= 3\times10^8 m/s$

b) $\sin 55 = \frac{x}{3m}$

$\therefore x = \sin 55 \times 3m$

$= 2.46m$

$= 246cm$ (to nearest centimetre)



c)

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$V = A \times H$

$A =$ area of rectangle - area of triangle

$= (78 \times 25) - \left(\frac{1}{2} \times 10 \times 10\right)$

$= 1950 - 50$

$= 1900 cm^2$

$V = 1900 \times 15$

$= 28\ 500 cm^3$

d) i) 30 (Count the non-shaded squares)

ii) $\frac{18}{30} = \frac{9}{15}$

iii) Table would now become a 10 ´ 10 square with 10 diagonal squares (shaded).

\ number of games = $10^2 - 10 = 100 - 10 = 90$

iv) If the competition had n players, the table would have n ´ n squares, and n diagonal squares.

\ Number of games: $N = n^2 - n$

e) i) Tim's weekly Gross Pay:

$= 35 \times \$9.50 + 3 \times 1.5 \times \$9.50$

$= \$332.50 + \$42.75$

$= \$375.25$

ii)

Mary's overtime pay

$= \$412.45 - (35 \times \$11.30)$

$= \$412.45 - \$395.50$

$= \$16.95$

Overtime hours

$= \$16.95 \div (1.5 \times \$11.30)$

$= 1$

iii)

$W = N \times R + 1.5 \times V \times R$

$W = NR + 1.5(VR)$

$W - NR = 1.5(VR)$

$\therefore V = \frac{W - NR}{1.5R}$

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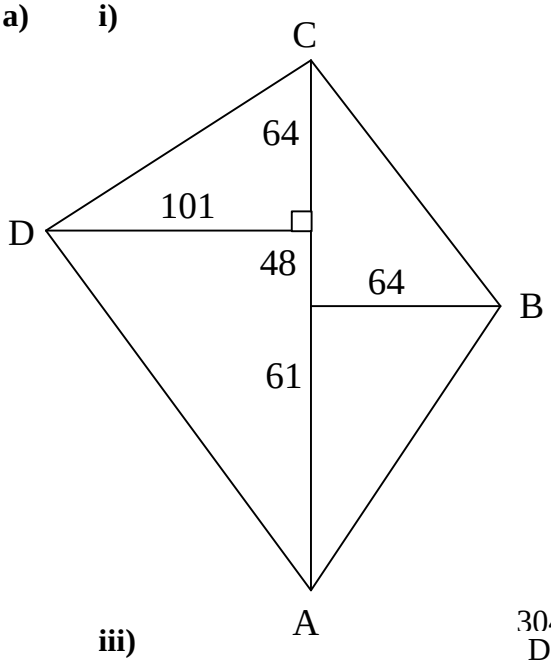
a) **i)**



ii)

let $CD = x$

using Pythagoras' Theorem:

$x^2 = 101^2 + 64^2$

$= 10201 + 4096$

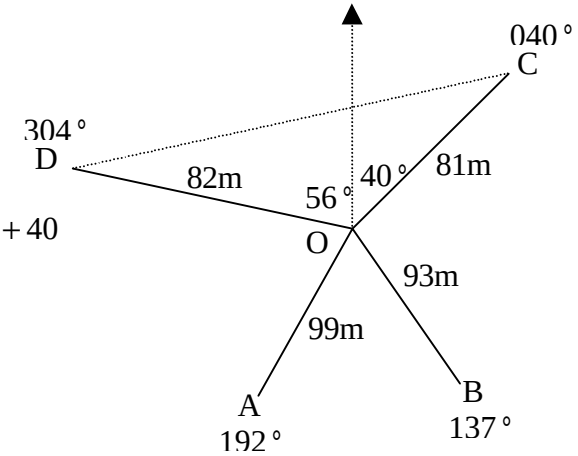
$x^2 = 14297$

$x = \sqrt{14297}$

$= 119.5$

$\therefore CD = 120m$ to nearest metre

iii)



$\angle DOC = (360^\circ - 304^\circ) + 40$

$= 96^\circ$

iv)

In $\triangle DOC$, by using the Cosine Rule:

$CD^2 = OC^2 + OD^2 - 2 \times OC \times OD \cos DOC$

$CD^2 = 81^2 + 82^2 - 2 \times 81 \times 82 \cos 96$

$CD^2 = 13285 - 1388.556$

$CD^2 = 14673.556$ (by calc.)

$\therefore CD = 121m$ (to nearest metre)

v) Each of the measurements taken for both surveys involve an element of error, either as a result of approximation or human error. Distances may have been rounded etc.

b) **i)** length of strip = circumference of base

$C = p\,d = p \times 20$

$= 62.8cm$

ii)

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Volume of Cylinder:

$V = p r^2 h$

$= p 10^2 \times 15$

$4712.39 cm^3$

$\text{Capacity} = \dfrac{4712.39}{1000}$

$= 4.7L$ to 2 sig. figures.

25

a) i) $F = 2C + 30$

ii)

Make C the subject of the equation:

$F = 2C + 30$

$2C = F - 30$

$\therefore C = \dfrac{F - 30}{2}$

b) i)

A: $\$3.18 + \$0.19 = \$3.37$

B: $\$3.37 + \$1.00 = \$4.37$

C: $\$4.37 \times \dfrac{6}{100} = \$0.26$

ii)

Annual payment $= \$500$

1st Year: $\text{Interest} = \$500 \times \dfrac{6}{100} = \$30$

$\text{End of Year} = \$500 + \$30 = \$530$

2nd Year: $\text{Interest} = \$1030 \times \dfrac{6}{100} = \$61.8$

$\text{End of Year} = \$1030 + 61.8 = \$1091.8$

iii)

From formula sheet,

$N = \dfrac{A}{(1+r)^n}$

$= \dfrac{5.97}{(1.06)^5}$

$= \$4.46$ (by calc.)

c) i) 9 litres/100km (from graph)

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ii) Fuel consumption at 30 *km/hr* = 12 litres/100*km*

$\therefore$ Fuel used in 20 *km* = $\frac{12L}{100km} \times 20km = 2.4$ litres

iii)

$C = 0.01S^2 - S + 33$

Petrol consumed at a speed of $80km/hr$:

$C = 0.01(80)^2 - 80 + 33$

$= 64 - 80 + 33$

$= 17$ litres/100*km*

iv)

When $S = 0$ is substituted into the equation:

$C = 0 - 0 + 33$

$= 33$ litres/100*km* $\Rightarrow$ which is not possible

$\therefore$ this formula would not be suitable for $S = 0$

26

a) **i)** (At end of paper)

ii) Curve B: Years 3, 4 and 5 are amost on curve B. Only Year 1 is on another curve (A). This indicates that B is the curve of best fit.

iii)

$S = V_O(1-r)^n$

$= \$20000(1-0.15)^{10}$

$= \$20000(0.85)^{10}$

$= \$3937.49$

$= \$3900$ to the nearest hundred dollars

b) **i)**

$IQR = Q_3 - Q_1$

$= 38 - 27 = 11$

ii)

Both sets of data are positively skewed, and have a similar histogram and in shape as well as similar spread with their rangeand interquartile range.

Distribution is also similar with mean and median.

iii)

The similarities outlined in **ii)** indicate that the data is generally similar in shape, spread and location. This would indicate that there is little difference between the ages of the actresses and the actors receiving these awards.

27

a) **i)** range = highest score – lowest score

= 39 – 3

=36 minutes

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ii) Possible values: 11, 12, or 13

iii)

Centre Y: $\bar{x} = 16.6$
$s_{n-1} = 7.8$

iv)

$\bar{x} \pm s_n = 8.8$ to 24.4 minutes.

$\therefore P(\text{between 8.8 and 24.4 minutes})$

$= \frac{15}{20}$

$= 0.75$

v)

Centre X waiting times should have both a higher mean and standard deviation when compared to Centre Y data. The four values of 39 weight the mean considerably, as well as increase the standard deviation.
Station X has times which are negatively skewed, whereas Station Y is more normally distributed.

b) **i)** people tested = 200

ii) % Accurate test results: $\frac{190}{200} \times 100 = 95\%$

iii) 19 + 9 = 28

v) P(disease) = $\frac{19}{28}$

28

a) **i)** A z-score of 2.2 indicates that Nathan's test mark is 2.2 standard deviations' above the mean.

ii)

$$Z = \frac{x - \bar{x}}{s}$$

$$2.2 = \frac{x - 61}{12.7}$$

$$2.2 \times 12.7 = x - 61$$

$$\therefore x = 2.2 \times 12.7 + 61$$

$= 89$ to the nearest mark

b) **i)** Gemma invested \$1000 p.a. for 10 years = \$10, 000

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ii)

$$A = m\left[\frac{(1+r)^n - 1}{r}\right]$$

$$A = 1000\left[\frac{(1+0.08)^{10} - 1}{0.08}\right]$$

$$= 1000\left[\frac{1.08^{10} - 1}{0.08}\right]$$

$$= \$14486.56$$

iii)

From the formula sheet,

$$A = P(1+r)^n$$

$$= 14486.56(1.08)^{30}$$

$$= \$145773.28 \text{ (by calc.)}$$

iv)

At the end of year 11, Gemma's investment had earned interest of 8% on the accrued amount ($14 486.56). This is worth $1158.92, which is more than Clare contributed ($1000). Thus the difference between the values of their investments continued to widen.

v) Advice on saving strategies:

- Save frequently, even if only in small amounts
- Leave secure earning investments for long periods
- Seek sound professional advice

Saving difficulties:

- Low income
- High living expenses
- Irregular periods of employment, especially in early working life.
- High-risk, speculative investments

26 a) i)

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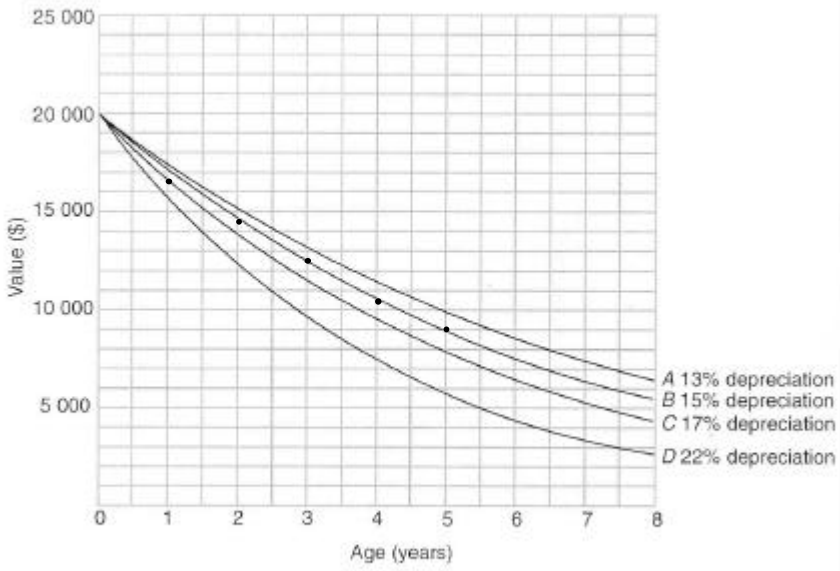

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