2001 HSC Examination Paper

Worked Answers

Section I

1. C	2. A	3. D	4. B	5. A
6. D	7. D	8. A	9. C	10. B
11. C	12. C	13. D	14. C	15. C
16. B	17. D	18. B	19. B	20. C
21. A	22. B			

1. Amount earned
$= 7 \times \$12 + 3 \times 1\frac{1}{2} \times \$12$
$= \$84 + \$54$
$= \$138.$

Answer C.

2. $w = \dfrac{15y}{y+12}$

$\therefore w = \dfrac{15 \times 7}{7+12}$

$= 5.526\ldots$ (by calc.)
$\doteqdot 5.53$ to 2 decimal places.

Answer A.

3. $A = \dfrac{\theta}{360} \times \pi r^2$

$= \dfrac{120}{360} \times \pi \times 9^2$

$= 84.8230\ldots$ (by calc.)
$\doteqdot 84.8\ \text{m}^2$ to 1 decimal place.

Answer D.

4. Interest $= \dfrac{0.05}{100} \times \$480 \times 16$

$= \$3.84$ (by calc.)

$\therefore$ Amount owing $= \$480 + \$3.84$
$= \$483.84.$

Answer B.

5. $3(x-2) - 2(x-1)$
$= 3x - 6 - 2x + 2$
$= x - 4.$

Answer A.

6. Imagine 1 followed by 3 zeros : $1000 = 10^3$
$\therefore$ 1 followed by 100 zeros is 10^{100}.

Answer D.

7. No. of left-handed students = 51
Percentage playing tennis

$= \dfrac{22}{51} \times 100$

$= 43.13\ldots$ (by calc.)
$\doteqdot 43\%.$

Answer D.

8.

$\bar{x} = \dfrac{(1\times2) + (2\times3) + (3\times5) + (4\times2) + (5\times1)}{\text{Total of Frequency}}$

$= \dfrac{2+6+15+8+5}{13}.$

Answer A.

9. When $n = 0$, value = \$2500
When $n = 5$, value = \$1000

$\therefore$ Depreciation $= \dfrac{\$1500}{5} = \$300$ per year

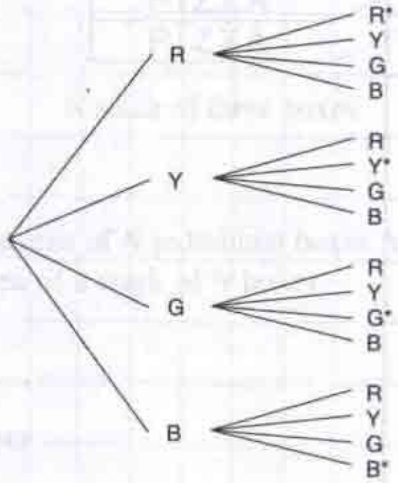
Answer C.

10. Taxable income
$= \$60\,780 - \$2420$
$= \$58\,360.$

Tax payable
$= \$11\,380 + 0.42 \times (\$58\,360 - \$50\,000)$
$= \$11\,380 + \$3511.20$
$= \$14\,891.20.$

Answer B.

11.



$P(\text{same colour}) = \dfrac{4}{16}$

$= \dfrac{1}{4}.$

Answer C.

12. $A = M\left\{\dfrac{(1+r)^n - 1}{r}\right\}$

$r = 4.8\% = 0.048$

$\therefore A = 1000\left\{\dfrac{(1+0.048)^5 - 1}{0.048}\right\}$

$= \$5503.598\ldots$ (by calc.)

$\doteqdot \$5504$ to nearest dollar.

Answer C.

13. $y = mx + b$

$m = \dfrac{4-2}{6-0} = \dfrac{1}{3}$

$b = 2$

$\therefore y = \dfrac{1}{3}x + 2$

Answer D.

14. Error $= \pm 0.5$ mm

Percentage error $= \pm \dfrac{0.5}{250} \times 100$

$= \pm 0.2\%$

Answer C.

15. Range = Highest – Lowest

$= 35 - 6$

$= 29$

Answer C.

16. There are 15 scores. The median is the 8th score. By counting, the median is 15.

Answer B.

17. From graph,

speed = 50 m/s

$= 50 \times 60$ m/1 min

$= 3000$ m/1 min

$= 3$ km/min

$= 3 \times 60$ km/h

$= 180$ km/h

Answer D.

18. $V = \dfrac{4}{3}\pi r^3$

$360 = \dfrac{4}{3}\pi r^3$

$360 \div \dfrac{4}{3} = \pi r^3$

$\pi r^3 = 270$

$r^3 = 270 \div \pi$

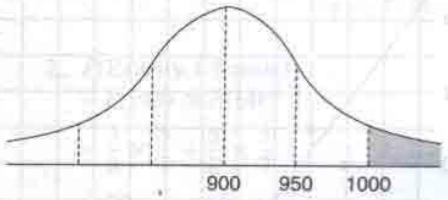
$= 85.943\ldots$ (by calc.)

$\therefore r = \sqrt[3]{85.943\ldots}$

$\doteqdot 4.4$ cm.

Answer B.

19.

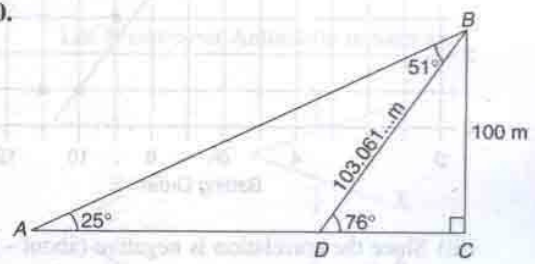


Shaded region = (100% – 95%) ÷ 2

= 2.5%.

Answer B.

20.



$\sin 76° = \dfrac{100}{BD}$

$\therefore BD = \dfrac{100}{\sin 76°}$

$= 103.061°$ (by calc.)

$\therefore \dfrac{AD}{\sin 51°} = \dfrac{103.061\ldots}{\sin 25°}$

$AD = \dfrac{103.061\ldots \times \sin 51°}{\sin 25°}$

$= 189.517\ldots$ m (by calc.)

$\doteqdot 190$ m to nearest m.

Answer C.

21. The scores are generally higher and they are less spread out.

Answer A.

22. No. of ways of placing the letters

$= 4 \times 3 \times 2 \times 1$

$= 24$

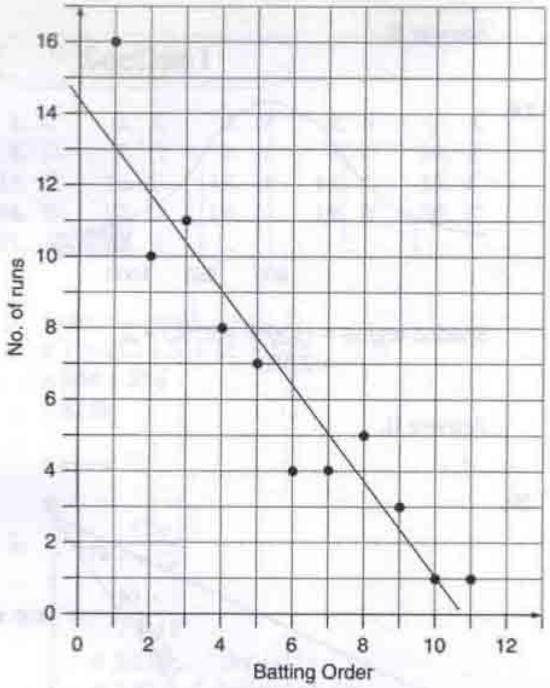
$\therefore P(\text{Correct letter}) = \dfrac{1}{24}$.

Answer B.

Section II

Question 23

(a) (i) (ii)



(iii) Since the correlation is negative (about –1), then the batting order and number of runs are inversely related, i.e. the earlier you bat, the more runs you score.

(b) (i) z-score = –2
Kim's score was 2 standard deviations below the mean.

(ii) Actual mark
$= 75 - 2 \times 5$
$= 65$

or, using the formula:

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

$$-2 = \frac{x - 75}{5}$$

$$-10 = x - 75$$

$$-10 + 75 = x$$

$$x = 65.$$

(c) (i) In East Park, the tallest tree is 18 m.

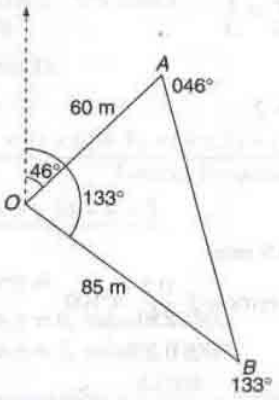
(ii) Median = 7 m.

(iii)

Central Park	East Park
• shape is symmetrical	• very positively skewed
• median = 7 m	• median = 4 m
• range of 6 m with heights from 4 m to 10 m	• range of 16 m with heights from 2 m to 18 m
• UQ = 9.5 m, $LQ \doteqdot 4.5$ m $\therefore IQR = 5$ m	• UQ = 9.5 m, LQ = 3 m $\therefore IQR = 6.5$ m

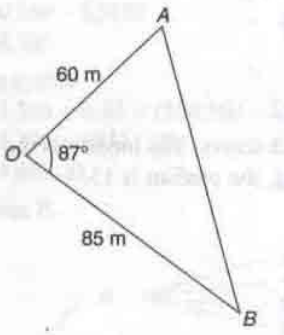
Question 24

(a) (i)



$\angle AOB = 133° - 46°$
$= 87°.$

(ii)



$A = \frac{1}{2}ab \sin C$ (from formula sheet)

$= \frac{1}{2} \times 85 \times 60 \times \sin 87°$

$= 2546.50\ldots \text{ m}^2$ (by calc.)

$= 2547 \text{ m}^2$ to nearest m^2.

(iii) $AB^2 = OA^2 + OB^2 - 2(OA)(OB) \cos \angle AOB$
$= 60^2 + 85^2 - 2(60)(85) \cos 87°$
$= 10\,291.173\ldots$ (by calc.)

$\therefore AB = \sqrt{10\,291.173\ldots}$
$= 101.445$ m
$\doteqdot 101$ m.

(b) (i) Time difference = 75° ÷ 15
= 5 hours.

(ii) 70° N.

(iii) $AB = \frac{\theta}{360} \times 2\pi r$ (from formula sheet)

$= \frac{70}{360} \times 2 \times \pi \times 6400$

$= 7819.07\ldots$ km (by calc.)

$= 7819$ km to nearest km.

OR

$AB = 70 \times 60$ ($1° = 60$ n mile)

$= 4200$ n miles

$= 4200 \times 1.852$

$= 7778.4$ km (by calc.)

$= 7778$ km to nearest km.

(c) (i) By measurement,

Fencing required

$= 9.4 + 11 + 8.5$

$= 28.9$ cm

Scale 1: 250

∴ Fencing required

$= 28.9 \times 250$

$= 7225$ cm

$= 72.25$ m.

(ii) Area of trapezium

$= \frac{1}{2}h(a + b)$

$h = 8.5$ cm (by measurement)

actual $h = 8.5 \times 250$

$= 2125$ cm

$= 21.25$ m

$a = 11$ cm (by measurement)

actual $a = 11 \times 250$

$= 2750$ cm

$= 27.5$ m

$b = 7$ cm (by measurement)

actual $b = 7 \times 250$

$= 1750$ cm

$= 17.5$ m

∴ Area of trapezium

$= \frac{1}{2} \times 21.25 \times (27.5 + 17.5)$

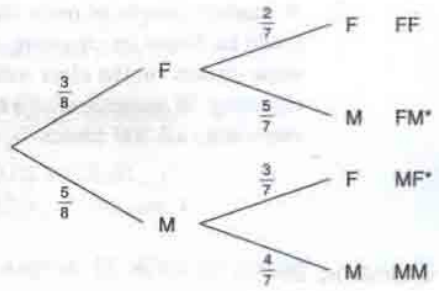
$= 478.125$ m^2

$\doteqdot 480$ m^2.

Question 25

(a) (i) $P(\text{Female}) = \frac{3}{8}$

(ii) 1.



2. $P(\text{Exactly 1 female}) = P(\text{FM}) \text{ or } P(\text{MF})$

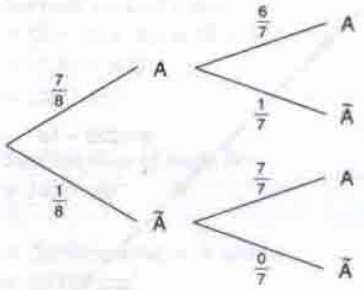
$= \frac{3}{8} \times \frac{5}{7} + \frac{5}{8} \times \frac{3}{7}$

$= \frac{30}{56}$

$= \frac{15}{28}$.

(iii) Yes, she has a good chance of remaining.

Let A represent Antoinette remaining:



∴ $P(\text{Antoinette remaining}) = P(\text{AA})$

$= \frac{7}{8} \times \frac{6}{7}$

$= \frac{3}{4}$.

(b) (i) No. of students in 80–89 kg class

$= 42 - 26$

$= 16$.

(ii) From the graph,

median $\doteqdot 79$ kg

(iii) $\frac{16}{50} \times 300 = 96$ students.

(iv) 1. Each male student in the year does not have an equal chance of being surveyed, e.g. students who might be at sports training or students who catch a late bus will not be surveyed.

2. A random sample of male students could be found by choosing every sixth male student on the class roll or by choosing 50 names out of a hat containing all 300 names.

Question 26

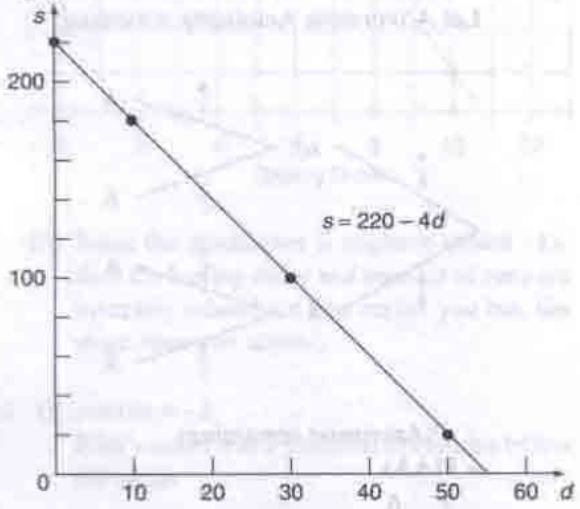
(a) (i) $s = 220 - 4d$
$= 220 - 4 \times 7.50$
$= 190.$

(ii)

d	10	30	50
s	180	100	20

When $d = 10$, $s = 220 - 4 \times 10$
$= 180$ etc.

(iii)



(iv) No, because $d = 60$ is not a possible value of d as it will give a negative number of stalls.

(b) (i) 1. $A = 200$
It is the price of a surfboard in Jan 2000, i.e. at the beginning (when $t = 0$).

2. 20%
($P = A \times (1.2)^t$ corresponds to the compound interest formula,
$A = P(1 + r)^n$
where $1 + r = 1.2$
$\therefore r = 0.2$
$= 0.2 \times 100\%$
$= 20\%$)

(ii) 1. During 2002, Tana will have just saved enough for a surfboard. This can be seen by the intersection of the two graphs.

2. $720 - 600 = 120$ clams.

3. $y = mx + b$ (straight line)
$\therefore c = mn + b$
When $n = 0$, $c = 0$ $\therefore b = 0$
$\therefore c = mn$
When $n = 24$ months (2 years),
$c = 240$
$\therefore 240 = m \times 24$
$\therefore m = 240 \div 24$
$= 10$
$\therefore c = 10n$

Question 27

(a) 110% of price = \$574.20
10% of price = \$574.20 ÷ 11
= \$52.20

$\therefore$ GST component = \$52.20.

(b) $S = V_0(1 - r)^n$
$= 42\,000(1 - 0.15)^4$
= \$21 924.26 (by calc.)

(c) (i) Rosetta had been contributing for twice as long and therefore earned more interest.

(ii) $A = M\left[\dfrac{(1 + r)^n - 1}{r}\right]$
$r = 6\%$ p.a.
$= 0.5\%$ p. month
$= 0.005$

Derek's investment:

$M = \$400$, $n = 20$ years
$= 240$ months

$\therefore A = 400\left[\dfrac{1.005^{240} - 1}{0.005}\right]$
= \$184 816.36

Rosetta's investment:

$M = \$200$, $n = 35$ years
$= 420$ months

$\therefore A = 200\left[\dfrac{1.005^{420} - 1}{0.005}\right]$
= \$284 942.05.

After a further 5 years, the difference is approx. \$100 126 whereas it was approx. \$84 576.
Hence, the difference has continued to grow as Rosetta is still earning interest on a larger initial amount.

(d) (i) 6.24% p.a. = 6.24 ÷ 12 p. month
$= 0.52\%$
$= 0.0052$ (calculated monthly).

(ii) $A = \$69\,684 \times 0.0052$
$= \$362.36$

$B = \$69\,684 + \$362.36 - \$680$
$= \$69\,366.36.$

(iii) 1. If $n = 120$,

$$\$680 \times \left\{ \frac{1.0052^{120} - 1}{0.0052 \times (1.0052)^{120}} \right\}$$

$\fallingdotseq \$60\,590$
$\therefore n = 120$ is too low.

2. Try $n = 140$
(with above calc. $\fallingdotseq \$67\,505$)
N.B. Next guess will be closer to 120 than 200.

Question 28

(a) (i) $n = kd^2$
$n = 8,\ d = 20$
$\therefore 8 = k \times 20^2$
$8 = k \times 400$

$$k = \frac{8}{400}$$

$\therefore k = 0.02$ (by calc.).

(ii) If $d = 52$,
$n = 0.02 \times 52^2$
$= 54.08$ (by calc.).

$\therefore$ Approx. 54 olives are required.

(iii) Area of square pizza
$= 25 \times 25$
$= 625 \text{ cm}^2$

Area of round pizza $= \pi r^2$
$\therefore 625 = \pi r^2$
$r^2 = 625 \div \pi$
$= 198.94\ldots$ (by calc.)
$\therefore r = 14.10\ldots$ (by calc.)
$\therefore$ diameter $= 28.20\ldots$ cm

No. of olives needed
$= kd^2$
$= 0.02 \times (28.20\ldots)^2$
$= 15.9\ldots$ (by calc.)

$\therefore$ Approx. 16 olives are needed.

(b) $T = \dfrac{k}{P}$

If $T = 10$, $P = 240$

$$\therefore 10 = \frac{k}{240}$$

$\therefore k = 2400$

$$\therefore T = \frac{2400}{P}$$

Now if $P = 500$,

$$T = \frac{2400}{500}$$

$= 4.8$ minutes.

(c) (i) Surface area of 1 box
$= (2 \times 30 \times 30) + (4 \times 30 \times 5)$
$= 1800 + 600$
$= 2400 \text{ cm}^2$.

(ii) Surface area of each box
$= 2400 \text{ cm}^2$

$\therefore$ Surface area of N boxes
$= 2400N \text{ cm}^3$

For a stack of N boxes:

Base: 30 cm × 30 cm
Height: $(5 \times N)$ cm

$\therefore$ Surface area of stack
$= (2 \times 30 \times 30) + (4 \times 30 \times 5 \times N)$
$= 1800 + 600\,N.$