

SECTION I

Answer ALL the questions in this section.

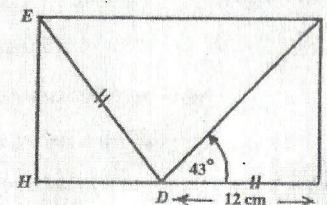
All working must be clearly shown.

1. (a) Using a calculator, or otherwise, determine the exact value of
- (i) $2.3^2 + 4.1^2$
 - (ii) $\frac{0.18}{0.6} - 0.003$
 - (iii) $\frac{3\frac{1}{3} - 2\frac{3}{5}}{2\frac{1}{5}}$ (6 marks)
- (b) (i) Write your answer in Part (a) (i) correct to one significant figure.
- (ii) Write your answer in Part (a) (ii) in standard form. (2 marks)
- (c) (i) Mr Mitchell deposited \$40 000 in a bank and earned simple interest at 7% per annum for two years.
- Calculate the amount he will receive at the end of the two-year period.
- (ii) Mr Williams bought a plot of land for \$40 000. The value of the land appreciated by 7% each year.
- Calculate the value of the land after a period of two years. (4 marks)
- Total 12 marks**

2. (a) Simplify:
- (i) $\frac{x^2 - 1}{x - 1}$
 - (ii) $\frac{4ab^2 + 2a^2b}{ab}$ (4 marks)
- (b) Express as a single fraction:
- $\frac{3p}{2} + \frac{q}{p}$ (2 marks)
- (c) Solve for x , given
- $3x^2 - 7x + 2 = 0$ (4 marks)
- Total 10 marks**

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3. (a) A club has 160 members, some of whom play tennis (T) or cricket (C) or both. 97 play tennis, 86 play cricket and 10 play neither, x play both tennis and cricket.
- (i) Draw a Venn diagram to represent this information.
 - (ii) How many members play both tennis and cricket? (5 marks)
- (b) In a beauty contest, the scores awarded by eight judges were:
- 5.9 6.7 6.8 6.5 6.7 8.2 6.1 6.3
- (i) Using the eight scores, determine:
 - a) the mean
 - b) the median
 - c) the mode
 - (ii) Only six scores are to be used. Which two scores may be omitted to leave the value of the **median** the same? (6 marks)
- Total 11 marks**
4. (a) (i) Using the formula
- $$t = \sqrt{\frac{5m}{12n}}$$
- calculate the value of t when $m = 20$ and $n = 48$.
- (ii) Express m as subject of the formula in (a) (i) above. (5 marks)
- (b) In the diagram below, **not drawn to scale**, $EFGH$ is a rectangle. The point D on HG is such that $ED = DG = 12$ cm and $\hat{GDF} = 43^\circ$.



Calculate correct to one decimal place

- (i) the length of GF
- (ii) the length of HD
- (iii) the size of the angle HDE . (7 marks)

Total 12 marks

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May 2004 Solutions

1(a) Using a calculator, or otherwise, determine the exact value of:

(i) $(2.3)^2 + (4.1)^2$
 $5.29 + 16.81 = 22.1$

(ii) $\frac{0.18}{0.6} - 0.003$

$$0.3 - 0.003 = 0.297$$

(iii) $\frac{3\frac{1}{3} - 2\frac{3}{5}}{2\frac{1}{5}}$ → Top
→ Bottom

Top: $3\frac{1}{3} - 2\frac{3}{5} = \frac{5 \times 10}{3} - \frac{3 \times 13}{5}$
$$\frac{50 - 39}{15} = \frac{11}{15}$$

Bottom: $2\frac{1}{5} = \frac{11}{5}$

Then: $\frac{11}{15} \div \frac{11}{5} \rightarrow \frac{11}{15} \times \frac{5}{11} = \frac{1}{3}$

b (i) Write a(i) to one significant figure:
 22.1 (1 s.f.)

Ans: 22

(ii) Write out a(ii) standard form
 0.297

Ans: $0.297 = 2.97 \times 10^{-1}$

c (i) Simple Interest : $\frac{P \times R \times T}{100}$

$$P = \text{\$}40,000$$

$$R = 7\%$$

$$T = 2 \text{ years}$$

$$I = \frac{P \times R \times T}{100}$$

$$= \frac{40,000 \times 7 \times 2}{100}$$

$$\text{Interest} = \text{\$}5,600.00$$

$$\begin{aligned} \text{Total Amount} &= \text{Principal} + \text{Interest} \\ &= 40,000 + 5,600 \\ &= \text{\$}45,600.00 \end{aligned}$$

(ii) Compound Interest : $A = P \times \left(1 + \frac{r}{100}\right)^T$

$$P = 40,000$$

$$R = 7$$

$$T = 2 \text{ years}$$

$$A = 40,000 \left(1 + \frac{7}{100}\right)^2$$

$$= \text{\$}45,796.00$$

Question 2

2(a) (i) $\frac{x^2-1}{x-1} \rightarrow$ difference of squares

working: $x^2-1 \rightarrow \sqrt{x^2} = x$
 $\sqrt{1} = 1$
 $x^2-1 = (x-1)(x+1)$

Ans: $\frac{x^2-1}{x-1} = \frac{\cancel{(x-1)}(x+1)}{\cancel{(x-1)}}$
 $= (x+1)$

(ii) $\frac{4ab^2 + 2a^2b}{ab} \rightarrow \frac{4ab^2}{ab} + \frac{2a^2b}{ab}$

further simplify: $\frac{4 \times \cancel{a} \times b \times b}{\cancel{a} \times \cancel{b}} + \frac{2 \times \cancel{a} \times a \times \cancel{b}}{\cancel{a} \times \cancel{b}}$
 $= 4b + 2a$

(b) Express as a single fraction:

$$p \times \frac{3p}{2} + \frac{2}{p} \times q$$
$$\frac{3p^2 + 2q}{2p}$$

L.c.m.
 $2 \overline{) 2, p}$
 $p \overline{) 1, p}$
 $1, 1$
L.c.m. = $2 \times p = 2p$

$$\frac{\cancel{2}p}{\cancel{2}} = p$$

$$\frac{2p}{\cancel{2}} = 2$$

$$\frac{2p}{\cancel{2}}$$

Ans: $\frac{3p^2 + 2q}{2p}$

(c) Solve for x , given

$$3x^2 - 7x + 2 = 0$$

$$a=3, b=-7, c=2$$

$$pq = b = -7$$

$$pq = a \cdot c = 3 \cdot 2 = 6$$

factors : 6 $\{1, 2, 3, 6\}$
 $\{-1, -2, -3, -6\}$

$$3x^2 - 7x + 2 \rightarrow 3x^2 - 1x - 6x + 2$$

$$x(3x-1) = 2(3x-1)$$

same

Ans: $(3x-1)(x-2)$

If says solve :

$$3x-1=0$$

$$3x = 1$$

$$x = \frac{1}{3}$$

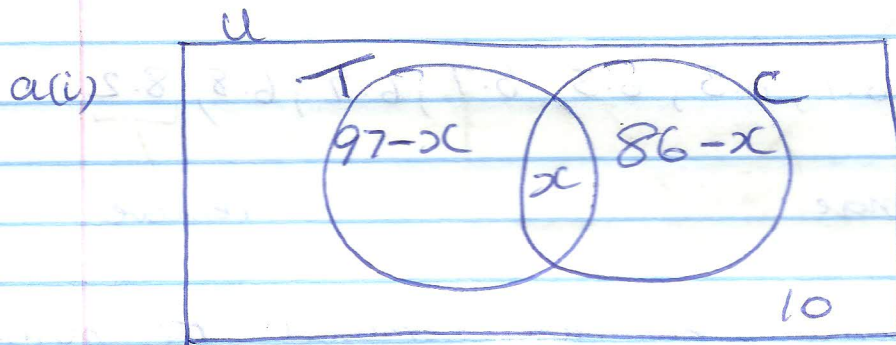
$$x-2=0$$

$$x = 2$$

Therefore $x = \frac{1}{3}$ or 2

Question 3

160 members.



(a) (ii) How many members play both Tennis and Cricket?

$$\begin{array}{ccccccc} (97-x) & + & x & + & (86-x) & + & 10 = 160 \\ \downarrow & & \downarrow & & \downarrow & & \downarrow \\ \text{Tennis} & & \text{both} & & \text{Cricket} & & \text{none.} \end{array}$$

$$\begin{aligned} 97 + 86 + 10 - x + x - x &= 160 \\ 193 - x &= 160 \\ 193 - 160 &= x \\ 33 &= x \end{aligned}$$

Therefore 33 members play both

b) 5.9, 6.7, 6.8, 6.5, 6.7, 8.2, 6.1, 6.3

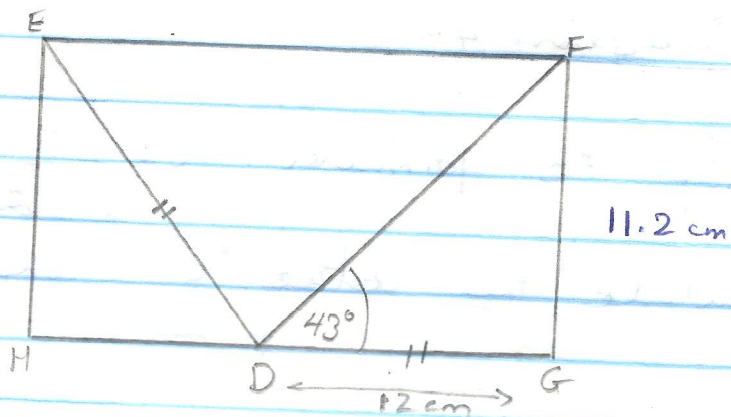
Arrange numbers in order:

5.9, 6.1, 6.3, 6.5, 6.7, 6.7, 6.8, 8.2

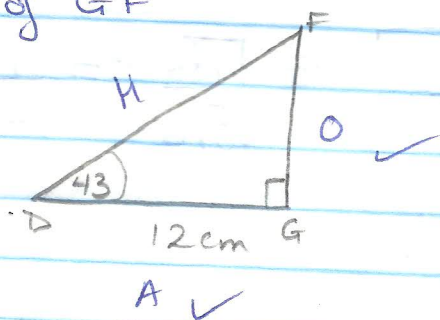
a) mean = $\frac{5.9 + 6.1 + 6.3 + 6.5 + 6.7 + 6.7 + 6.8 + 8.2}{8}$

Ans: $= \frac{53.2}{8} = 6.65$

mode: $\frac{6.5 + 6.7}{2} = 6.6$



The length of GF



SOH CAH TOA

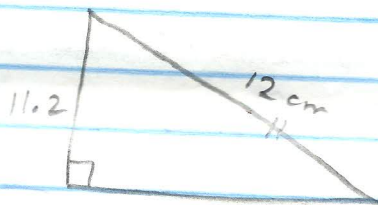
$$(i) \tan \theta = \frac{O}{A}$$

$$\tan 43 = \frac{O}{12}$$

$$\tan 43 \times 12 = 11.19$$

$$\approx 11.2 \text{ cm}$$

(ii) The length of HD



$$a^2 + b^2 = c^2$$

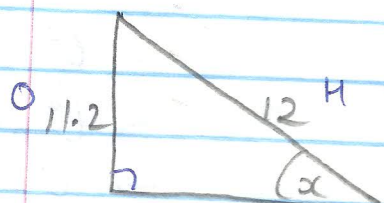
$$(11.2)^2 + b^2 = (12)^2$$

$$b^2 = 12^2 - 11.2^2$$

$$b = \sqrt{18.56}$$

$$HD = 4.3$$

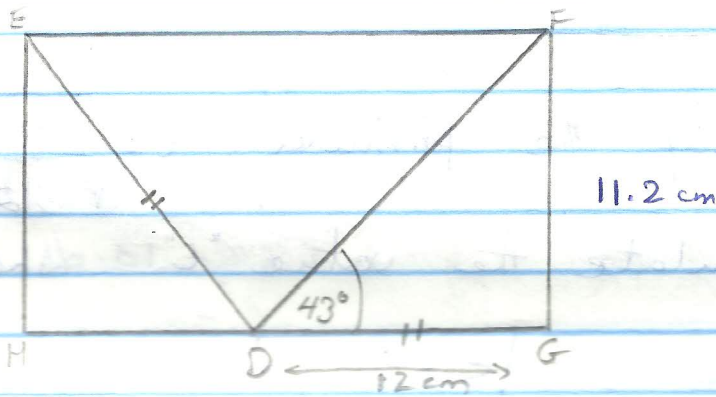
(iii) Find angle: \widehat{HDE}



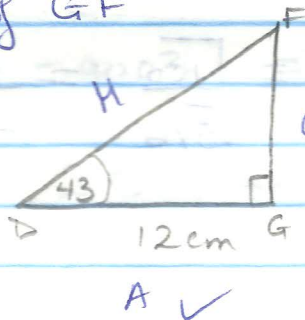
SOH CAH TOA

$$\sin \theta = \frac{O}{H}$$

$$\sin \theta = \frac{11.2}{12}$$



The length of GF



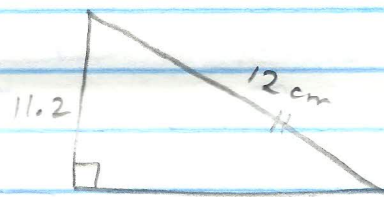
SOH CAH TOA

(i) $\tan \theta = \frac{O}{A}$

$\tan 43 = \frac{O}{12}$

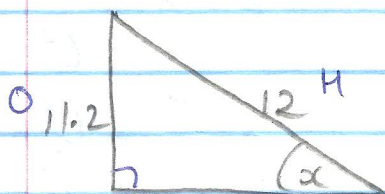
$\tan 43 \times 12 = 11.19$
 $\approx 11.2 \text{ cm}$

(ii) The length of HD



$a^2 + b^2 = c^2$
 $(11.2)^2 + b^2 = (12)^2$
 $b^2 = 12^2 - 11.2^2$
 $b = \sqrt{18.56}$
 $HD = 4.3$

(iii) Find angle: \widehat{HDE}



SOH CAH TOA

$\sin \theta = \frac{O}{H}$

$\sin \theta = \frac{11.2}{12}$

$\theta = \sin^{-1} \left(\frac{11.2}{12} \right)$
 $= 68.96 \approx 70^\circ$

Question 4

Using the formula: $t = \sqrt{\frac{5m}{12n}}$

Calculate the value "t" when $m=20$, $n=48$

$$t = \sqrt{\frac{5 \times 20}{12 \times 48}}$$

$$= \sqrt{\frac{100}{576}} = \frac{\sqrt{100}}{\sqrt{576}} = \frac{10}{24}$$

$$= \frac{10}{24}$$

$$= \frac{5}{12} = 0.42$$

(ii) Express m as the subject a(i)

$$t = \sqrt{\frac{5m}{12n}}$$

$$t = \sqrt{\frac{5m}{12n}}$$

method 1

$$t^2 = \frac{5m}{12n}$$

$$t^2 \times 12n = 5m$$

$$\frac{t^2 \times 12n}{5} = m$$

$$\text{Ans: } m = \frac{t^2 \times 12n}{5}$$

Method 2:

mul by 5

Div by 12n

Sq. root

Sq.

mul. by 12n

Div "5"

$$- t^2$$

$$\rightarrow t^2 \times 12n$$

$$\rightarrow \frac{t^2 \times 12n}{5}$$