

# End of Year Examination Paper 2

## INSTRUCTION TO CANDIDATES:

1. Answer **all** questions.
2. Write your answers and working in the spaces provided.
3. Omission of essential working will result in loss of marks.
4. Calculators may be used in this paper.
5. If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer correct to three significant figures. Give answers in degrees correct to one decimal place.

Marks Obtained
50

**1** With the use of a calculator,

- (a) evaluate  $3 - \frac{\sqrt{3.5 + 4.71^2}}{3.76}$ , correct to 4 significant figures,
- (b) express  $\frac{13}{99}$  as a recurring decimal,
- (c) evaluate the 18<sup>th</sup> multiple of 23.

*Ans:* (a) \_\_\_\_\_ [1]

(b) \_\_\_\_\_ [1]

(c) \_\_\_\_\_ [1]

**2** An election candidate wishes to spend **less than** \$6000 on advertising. \$3200 will be spent on banners, and the rest will be spent on  $x$  ball-point pens bearing his name. Each pen costs \$2.

- (a) Form an inequality in  $x$  and solve the inequality.
- (b) Find the greatest number of ball-point pens that can be distributed.

*Ans:* (a) \_\_\_\_\_ [2]

(b) \_\_\_\_\_ [1]

**3** (a) Solve the following equations.

(i)  $\frac{3-x}{5} = x$

*Ans:* (a)(i)  $x =$  \_\_\_\_\_ [2]

(ii)  $3a + 7 = 2(2 - 5a)$

*Ans:* (a)(ii)  $a =$  \_\_\_\_\_ [2]

(b) Given the formula  $W^2 = \frac{S}{T-17}$ , find the value of  $S$  when  $W = -2$  and  $T = 20$ .

*Ans:* (b)  $S =$  \_\_\_\_\_ [2]

**4** (a) Express  $3000 \text{ cm}^2$  as a percentage of  $2.5 \text{ m}^2$ .

*Ans:* (a) \_\_\_\_\_ % [2]

(b) During a shipment of a batch of vases, 5% of them were broken,  $\frac{1}{16}$  were stolen and the rest were transported safely.

(i) Calculate the percentage of vases that were stolen.

(ii) Given that 3550 vases were transported safely, calculate the initial number of vases that were originally shipped.

*Ans:* (b)(i) \_\_\_\_\_ % [1]

(ii) \_\_\_\_\_ [2]

- 5** A train travels at 160 km/h for 1h 30 minutes, rests for 30 min at a station, and then travels the remaining 300 km for 2 hours. Find
- (a) the distance travelled by the train before the rest,
  - (b) the speed of the train after the rest,
  - (c) the average speed of the whole journey, giving your answer correct to 2 decimal places.

*Ans:* (a) \_\_\_\_\_ km [1]

(b) \_\_\_\_\_ km/h [1]

(c) \_\_\_\_\_ km/h [2]

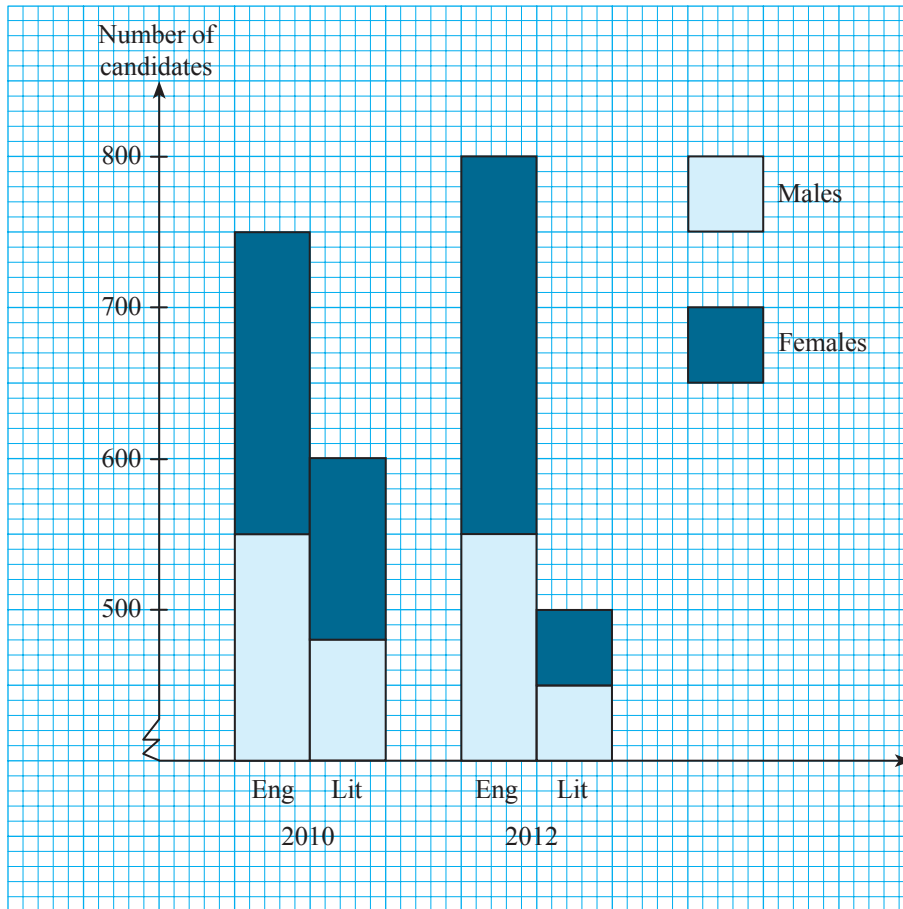
- 6** (a) Construct  $\triangle ABC$  such that  $AB = 8$  cm,  $BC = 6$  cm and  $AC = 7$  cm.  
(b) Measure and write the value of  $\angle ACB$ .  
(c) By construction, locate point  $X$  on  $AC$  such that  $x$  is equidistant from  $A$  and  $B$ .

*Ans:* (a) *Construction question* [2]

(b)  $\angle ACB =$  \_\_\_\_\_ $^{\circ}$  [1]

(c) *Construction question* [2]

- 7 The following chart shows the number of male and female candidates taking a national examination in the subjects of English and Literature in 2010 and 2012 in a junior college.



- (a) Calculate the ratio of male candidates to that of female candidates taking the English examination in 2010.  
 (b) Find the number of candidates taking Literature in 2010 and 2012.  
 (c) Using your answer in (b), explain how does the graph mislead readers.

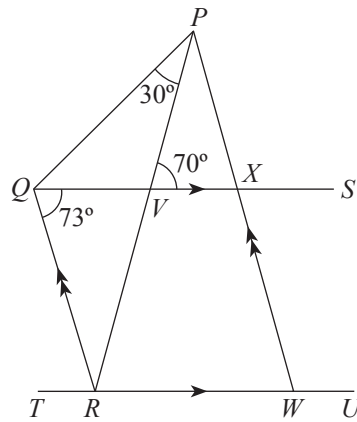
Ans: (a) \_\_\_\_\_ : \_\_\_\_\_ [2]

(b) 2010: \_\_\_\_\_ [1]

2012: \_\_\_\_\_ [1]

(c) \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ [1]

- 8 In the diagram below,  $QS \parallel TU$  and  $QR \parallel PW$ .



Find

- $\angle PQV$ ,
- $\angle VRQ$ ,
- $\angle RPW$ .

Ans: (a)  $\angle PQV = \underline{\hspace{2cm}}^\circ$  [1]

(b)  $\angle VRQ = \underline{\hspace{2cm}}^\circ$  [1]

(c)  $\angle RPW = \underline{\hspace{2cm}}^\circ$  [1]

- 9 Machine  $A$  can print  $x$  books in an hour, while Machine  $B$  can print 60 **more** books in an hour. In 24 hours, Machine  $A$  and Machine  $B$  print a total of 2400 books.
- Form an equation in  $x$  and solve it.
  - Calculate the time in hours Machine  $B$  alone takes to print 2400 books.

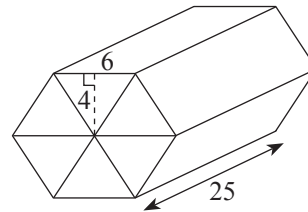
Ans: (a)  $x = \underline{\hspace{2cm}}$  [3]

(b)  $\underline{\hspace{2cm}}$  hours [1]

- 10** The diagram shows a solid hexagonal prism. The cross-section of the prism is a regular hexagon made up of six equilateral triangles, with sides of length 6 cm. The length of the prism is 25 cm.

Calculate

- (a) the volume of the prism,  
 (b) the total surface area of the prism.



Ans: (a) \_\_\_\_\_ cm<sup>3</sup> [2]

(b) \_\_\_\_\_ cm<sup>2</sup>[2]

- 11** Answer the whole of this question on graph paper.

- (a) A table of values for the equation  $y = -2x + 7$  is shown below.

$x$	-1	0	1	2
$y$	$a$	7	5	$b$

- (i) Find the values of  $a$  and  $b$ . [1]  
 (ii) Using a scale of 2 cm to represent 1 unit, draw a horizontal  $x$ -axis for  $-2 \leq x \leq 4$ .  
 Using a scale of 1 cm to represent 1 unit, draw a vertical  $y$ -axis for  $-6 \leq y \leq 10$ .  
 Plot the points in the table and draw the graph of  $y = -2x + 7$ . [3]  
 (iii) On the same graph paper, draw  $y = 4$ . [1]
- (b) From your graph,  
 (i) write down the  $x$ -intercept of  $y = -2x + 7$ , [1]  
 (ii) calculate the area of the triangle enclosed by the lines  $y = -2x + 7$ ,  $y = 4$  and the  $y$ -axis. [2]

**Solutions to:**

# End of Year Examination Paper 2

1. (a)  $3 - \frac{\sqrt{3.5 + 4.71^2}}{3.76} \approx 1.6521414$   
 $= 1.652$  (4 s.f.)  
 (b)  $\frac{13}{99} = 0.13131313 \dots$   
 $= 0.\dot{1}\dot{3}$   
 (c)  $18^{\text{th}}$  multiple of 23 =  $18 \times 23$   
 $= 414$

2. (a) Total amount spent =  $\$3200 + 2x$   
 $3200 + 2x < 6000$   
 $2x < 2800$   
 $x < 1400$   
 (b) Greatest number of pens = 1399

3. (a) (i)  $\frac{3-x}{5} = x$   
 $3 - x = 5x$   
 $3 = 6x$   
 $x = \frac{3}{6}$   
 $= \frac{1}{2}$

- (ii)  $3a + 7 = 2(2 - 5a)$   
 $3a + 7 = 4 - 10a$   
 $10a + 3a = 4 - 7$   
 $13a = -3$   
 $a = -\frac{3}{13}$

- (b) When  $W = -2$  and  $T = 20$ ,  
 $(-2)^2 = \frac{S}{20 - 17}$   
 $4 = \frac{S}{3}$   
 $S = 12$

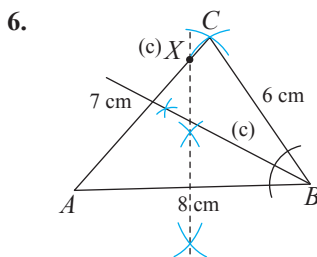
4. (a)  $2.5 \text{ m}^2 = (2.5 \times 100 \times 100) \text{ cm}^2$   
 $= 25000 \text{ cm}^2$   
 Required percentage =  $\frac{3000}{25000} \times 100\%$   
 $= 12\%$

- (b) (i) Percentage stolen =  $\frac{1}{16} \times 100\%$   
 $= 6.25\%$

- (ii) Percentage transported safely  
 $= 100\% - 5\% - 6.25\%$   
 $= 88.75\%$   
 Initial number of vases =  $\frac{3550}{88.75\%} \times 100\%$   
 $= 4000$

5. (a)  $1 \text{ h } 30 \text{ min} = 1.5 \text{ h}$   
 Distance travelled before rest =  $160 \times 1.5$   
 $= 240 \text{ km}$   
 (b) Speed of train after rest =  $300 \text{ km} \div 2 \text{ h}$   
 $= 150 \text{ km/h}$

(c) Average speed =  $\frac{\text{Total distance}}{\text{Total time}}$   
 $= \frac{240 + 300}{1.5 + 0.5 + 2}$   
 $= 135 \text{ km/h}$



(Figure above has been scaled down.)

- (a) Construction steps  
 Step 1: Draw  $AB = 8 \text{ cm}$ .  
 Step 2: Draw arc of radius 6 cm centred at  $B$ .  
 Step 3: Draw arc of radius 7 cm centred at  $A$ .  
 Step 4: Locate point  $C$  which is the intersection of the arcs.

(b)  $\angle ACB = 76^\circ$  ( $\pm 1^\circ$ )

- (c) Construction steps  
 Step 1: Draw perpendicular bisector of  $AB$ .  
 Step 2: Locate point  $X$  which is the intersection of the perpendicular bisector and  $AC$ .

7. (a) Required ratio =  $550 : 200$   
 $= 11 : 4$   
 (b) Number of candidates in 2010 = 600  
 Number of candidates in 2012 = 500  
 (c) Visually, it appears that the number of candidates taking Literature in 2010 is twice that of 2012, but from (b), it is not. This happens because the vertical axis does not start from zero.

8. (a)  $\angle PQV = 70^\circ - 30^\circ$  (ext.  $\angle$  of  $\Delta$ )  
 $= 40^\circ$   
 (b)  $\angle VRQ = 180^\circ - 30^\circ - 40^\circ - 73^\circ$  ( $\angle$  sum of  $\Delta PQR$ )  
 $= 37^\circ$   
 (c)  $\angle RPW = \angle VRQ$  (alt.  $\angle$ s,  $QR \parallel PW$ )  
 $= 37^\circ$

9. (a) Machine  $B$  prints  $(x + 60)$  books an hour.  
 $24x + 24(x + 60) = 2400$   
 $24x + 24x + 1440 = 2400$   
 $48x = 960$   
 $x = 20$   
 (b) Rate of Machine  $B = (20 + 60)$  books/h  
 $= 80$  books/h

$$\begin{aligned} \text{Time taken by Machine B only} &= 2400 \div 80 \\ &= 30 \text{ hours} \end{aligned}$$

$$\begin{aligned} 10. (a) \text{ Base area} &= 6 \left[ \frac{1}{2}(6 \times 4) \right] \\ &= 72 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume of prism} &= 72 \times 25 \\ &= 1800 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} (b) \text{ Total surface area} &= (\text{Perimeter base} \times \text{height}) + 2(\text{base area}) \\ &= (6 \times 6 \times 25) + 2(72) \\ &= 1044 \text{ cm}^2 \end{aligned}$$

$$\begin{aligned} 11. (a) (i) \text{ When } x = -1, \\ a &= -2(-1) + 7 \\ &= 9 \end{aligned}$$

$$\begin{aligned} (ii) \text{ When } x = 2, \\ b &= -2(2) + 7 \\ &= 3 \end{aligned}$$

(iii) (See diagram 11. (a)(iii) on page S2.)

$$(b) (i) x = 3.5$$

$$\begin{aligned} (ii) \text{ Area of triangle } A &= \frac{1}{2} \times 1.5 \times 3 \\ &= 2.25 \text{ units}^2 \end{aligned}$$

### 11. (a)(iii)

