



Preca College
Mathematics Entrance Exam
25th June 2012
Time: 8:00 - 10:00

Name: _____

Index number: _____

Answer all questions. All necessary working must be shown on this paper

DO NOT
WRITE IN
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1. Write the following as a power of 3. (4 marks)

(a) 9^5

(b) 27^n

Answer: _____

Answer: _____

2. Solve the following (5 marks)

(a) $2^x = \frac{1}{32}$

(b) $x^{-3} = 0.001$

Answer: _____

Answer: _____

3. Solve $\frac{1-2x}{2} - \frac{1-3x}{4} = \frac{1-x}{3}$ (4 marks)

Answer: _____

4. In a village, the ratio of males to females is 3:5. What fractions go in the gaps of the following statements? (4 marks)

The numbers of males is ____ of the number of females.

Females make up ____ of the population of the village.

Half of the males are over fifty, so males over fifty make up ____ of the population.

5. A tiger runs at a speed of 50 kilometres per hour for 9 seconds.
How many metres does the tiger run? (4 marks)

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Answer: _____

6. The volume of a cone, in cm^3 , is given by $V = \frac{\pi r^2 h}{3}$ (5 marks)

r is the base radius and h is the height, both in cm.

- (a) Rearrange the formula to make r the subject.

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Answer: _____

- (b) Use your arrangement to work out the base radius of a cone of volume 100 cm^3 and height 8 cm. Give your answer to three significant figures.

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Answer: _____

7. Farm animals can only be described as ‘free-range’ if they are given enough space.
The table shows the limits. (7 marks)

Bird	Maximum live weight per m^2
Chicken	27.5 kg
Duck, guinea fowl or turkey	25.0 kg
Goose	15.0 kg

- (a) Assuming that the live weight of an adult chicken is about 4 kg, how many chickens could you keep in a yard with area 7.8 m^2 ?

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Answer: _____

- (b) A farmer has 18 m^2 available for free-range birds. These are the birds she wants to keep with their typical live weights.

Duck: 3 kg

Turkey: 12 kg

Goose: 9 kg

She wants to keep an equal number of each type of bird. What is the most she can keep of each bird?

.....

Answer: _____

8. Use a calculator and write the following in standard form, correct to 3 s.f. **(4 marks)**

(a) $\frac{1.7 \times 10^9}{8 \times 10^7}$

(b) $\sqrt{(1.4 \times 10^5) \times (9 \times 10^{-6})}$

Answers: (a) _____

(b) _____

9. Two pieces of tape, of lengths 864 cm and 600 cm, are both to be cut into a number of shorter pieces of equal length. **(6 marks)**

(a) What is the greatest possible length to cut both tapes such that no tape is left over from either length?

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Answer (a): _____

(b) How many pieces of tape will there be?

.....

Answer (b): _____

10. A solid metal cylinder with diameter 2 cm and height 4 cm stands inside an empty cylindrical measuring jar with a diameter of 4 cm. Water is poured into the jar to a depth of 3 cm. (Give all your answers as multiples of π)

(6 marks)

- (a) Find the volume of water poured into the cylinder.

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Answer (a): _____

- (b) The additional volume of water required just to cover the metal cylinder

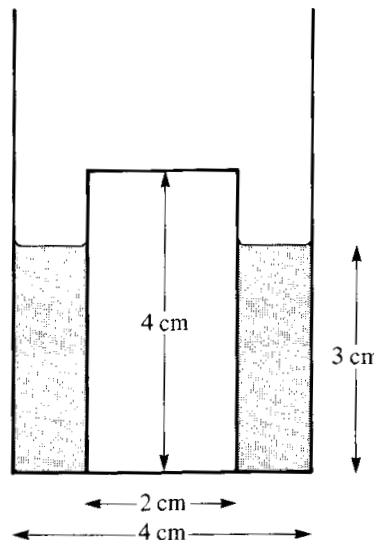
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Answer (b): _____

- (c) The total volume of water required if the depth of water in the cylinder at its deepest point is 6 cm.

.....

Answer (c): _____



11. A rectangle has length 20 cm and width 15 cm, each measurement being given correct to the nearest whole number. Find:

(6 marks)

- (a) The upper and lower bounds for its lengths.

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Answer (a): Length: Upper bound: _____ and Lower bound: _____

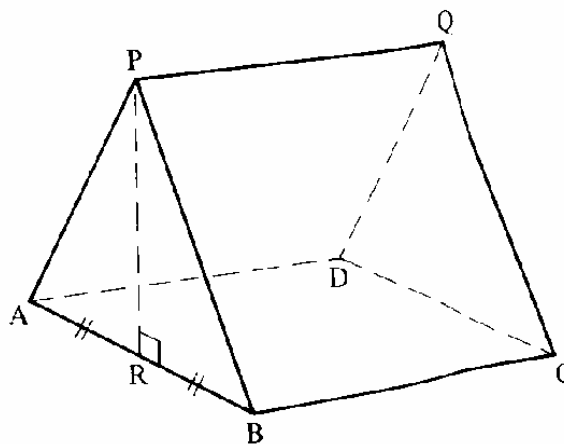
Width: Upper bound: _____ and Lower bound: _____

- (b) The upper and lower bounds for its area.

.....

Answer (b): Upper bound: _____ and Lower bound: _____

12. The diagram shows a triangular prism.
 $AB = 6$ cm, $AP = PB = 5$ cm and $PQ = 8$ cm.
 $ABCD$ is horizontal. **(6 marks)**



- (a) Find the surface area of the prism.

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Answer (a): _____

- (b) Find the volume of the prism.

.....

Answer (b): _____

13. A canteen needs stocks of x canned fizzy drinks and y tetra-paks of fruit juices. There is room for a total of 200 drinks. The minimum order is for 100 drinks. At least twice as many cans as tetra-paks have to be ordered. **(8 marks)**

- (a) Express these statements as inequalities and use a graph to show the region in which the inequalities are satisfied. On each axis use a scale of 1 cm to 20 drinks.

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Inequalities: _____

- (b) If the cost of a can is 40 c and the cost of a tetra-pak is 25 c. Using the graph, or otherwise, how many of each type of drink should be ordered to minimise the cost? What is this cost?

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Number of cans: _____, number of tetra-paks: _____, cost: _____

14. Simplify the following: (4 marks)

(i) $3\sqrt{12} + \sqrt{27}$

(ii) $\sqrt{108} - \sqrt{75}$

(i)

..... Answer: _____

(ii)

..... Answer: _____

15. Look at the numbers -6, 0.5, $\frac{2}{5}$, 3, $\sqrt{5}$, 1.25, -0.5 (4 marks)

Write down the:

(i) prime number: _____ (ii) integers: _____ (iii) irrational number: _____

Insert the given numbers in the spaces below:

_____ < _____ < _____ < _____ < _____ < _____ < _____

16. A bag contains 5 white discs and 5 black discs. Two players draw discs from the bag one at a time in turns and do not replace them. Andy goes first and draws a white disc. Beth follows and draws a black disc. (6 marks)

(a) What is the probability that

(i) Andy draws a white disc in his second turn

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Answer (i): _____

(ii) Andy fails to draw a white disc on his second turn but Beth draws a black disc on her second turn

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.....
.....

Answer (ii): _____

(iii) After three dips into the bag Andy has two discs of the same colour?

.....
.....
.....

Answer (iii): _____

(b) What is Beth's chance of drawing a black disc if she has her second go before Andy has his second go?

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Answer (b): _____

17. In triangle ABC, $AB = 7$ cm, angle $A = 32^\circ$ and angle $C = 49^\circ$. Find BC, *without using a scale drawing*. **(5 marks)**

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Answer: length BC = _____

18. After two successive increases of 10%, the cost of a rail journey was € 59.29. What was the cost before the first increase? **(4 marks)**

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.....

Answer: _____

19. Simplify (a) $\frac{x^2 + 3x}{2x^2 + 2x - 12}$ (b) $\frac{1}{2x+1} - \frac{3}{x-2}$ (4 marks)

(a).....

.....

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Answer: _____

(b).....

.....

.....

Answer: _____

20. The operation \bullet is defined on real numbers a and b by (4 marks)

$$a \bullet b = a^2 - b^2$$

(a) Find the value of $3 \bullet 2$.

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Answer (a): _____

(b) If $a = 4$, $b = -1$ and $c = 2$ find the value of (i) $a \bullet b - b \bullet c$ (ii) $(a \bullet b) \bullet c$

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Answer (i): _____ and (ii): _____

END OF PAPER